



# Geographic Information System

## Spatial Statistics I Lab Practice

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# Outline

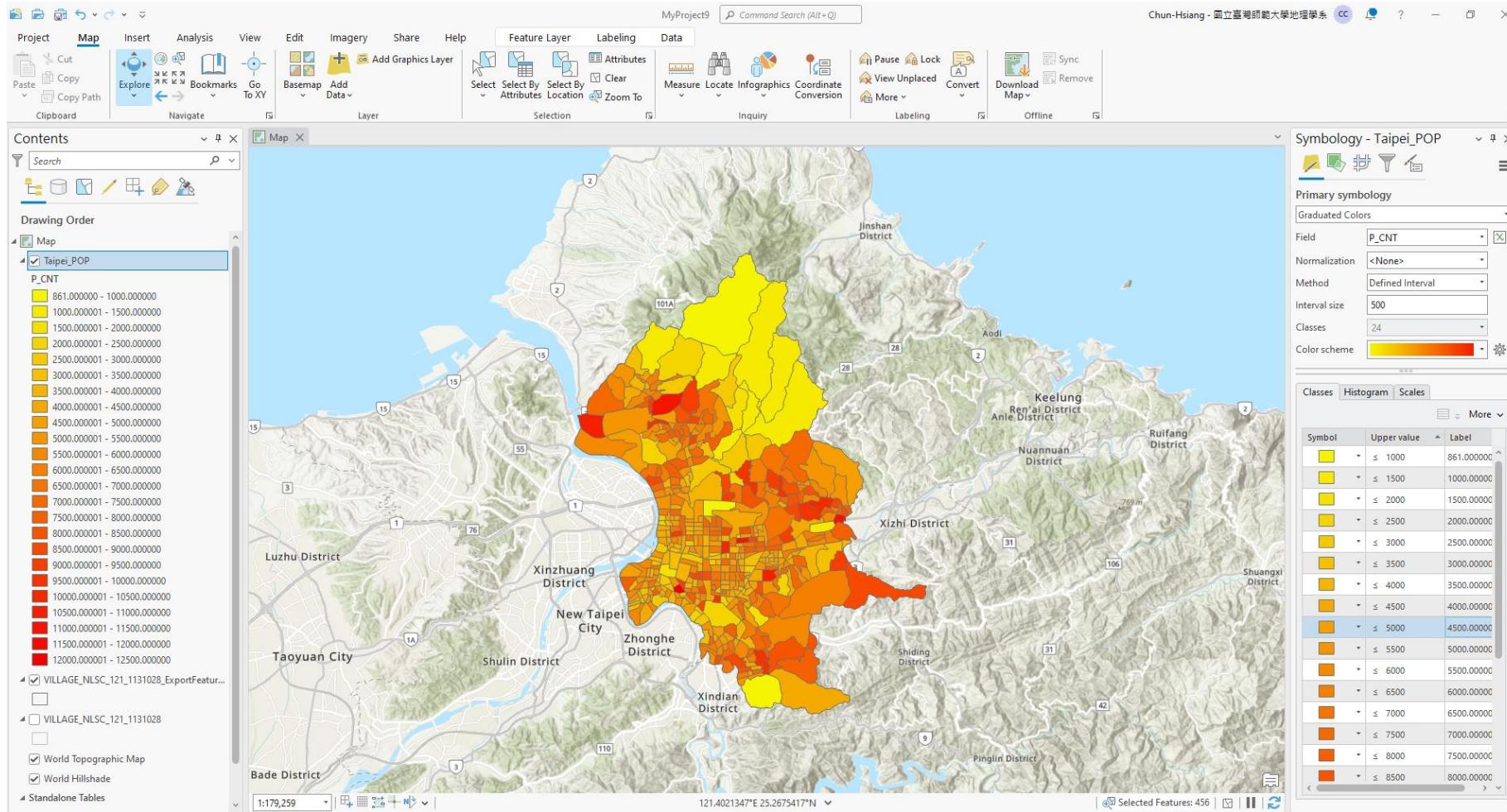
- Observe the central tendency of Taipei traffic accident data between January and July
- Observe the average nearest neighbor of Taipei traffic accident data between January and July
- Observe the spatial pattern of Taipei population data



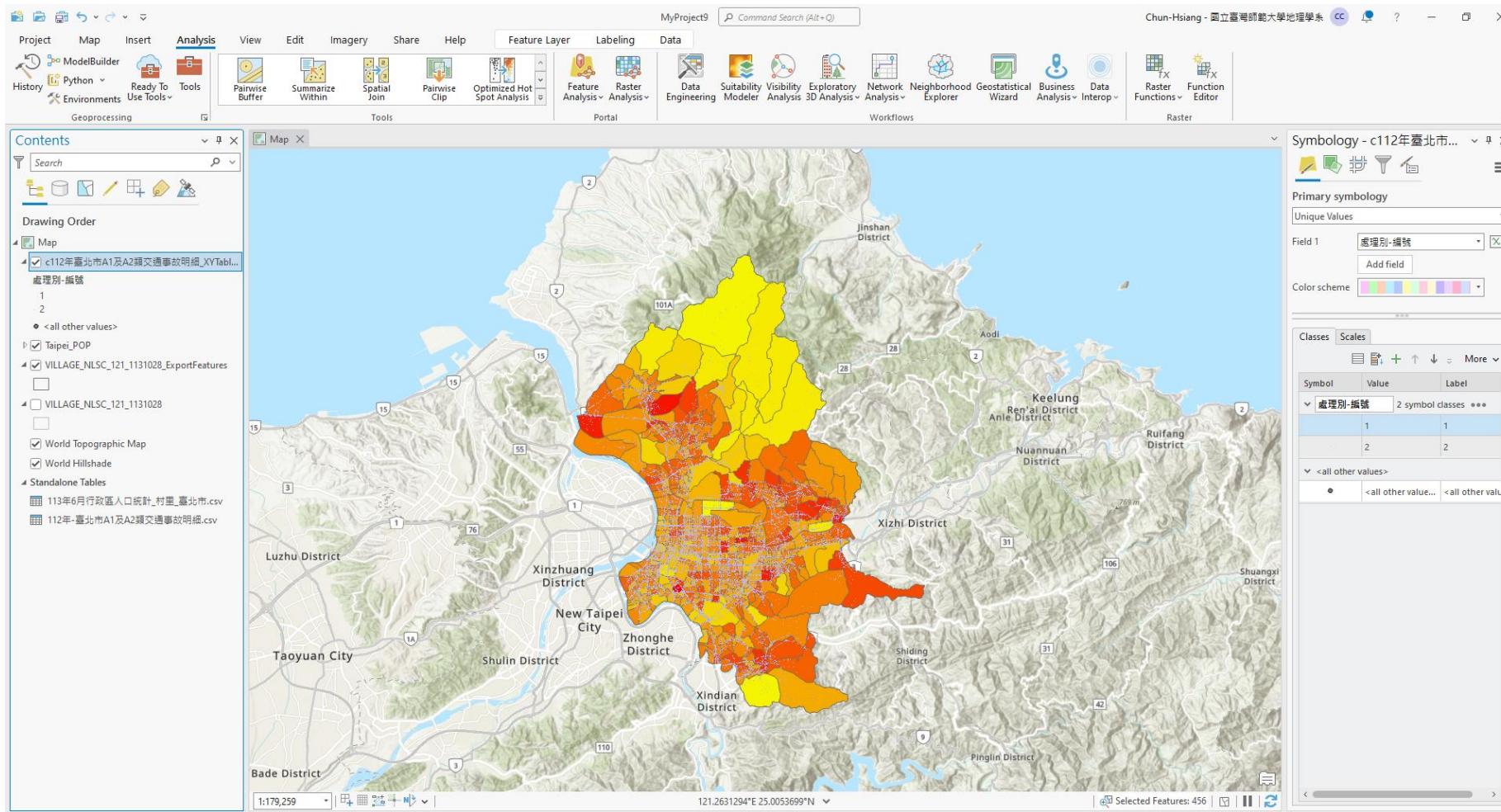
# Initial Settings (...)

- 1) Set up the CRS of the map
- 2) Load Taipei Population Data, Taipei Traffic Accident Data, and Taiwan Village Data
- 3) Select all Taipei villages from the Taiwan village data and export as a new feature data named “Taipei\_POP”
- 4) Join Taipei population into Taipei\_POP
- 5) Use XY Table To Point to convert Taipei traffic accident data into Point data
- 6) Select 112/01 and 112/07 Taipei traffic accident and export as a new feature data, respectively, named “TrafficAccident\_11201” and “TrafficAccident\_11207”
- 7) Spatial Join Taipei traffic accident into Taipei\_POP

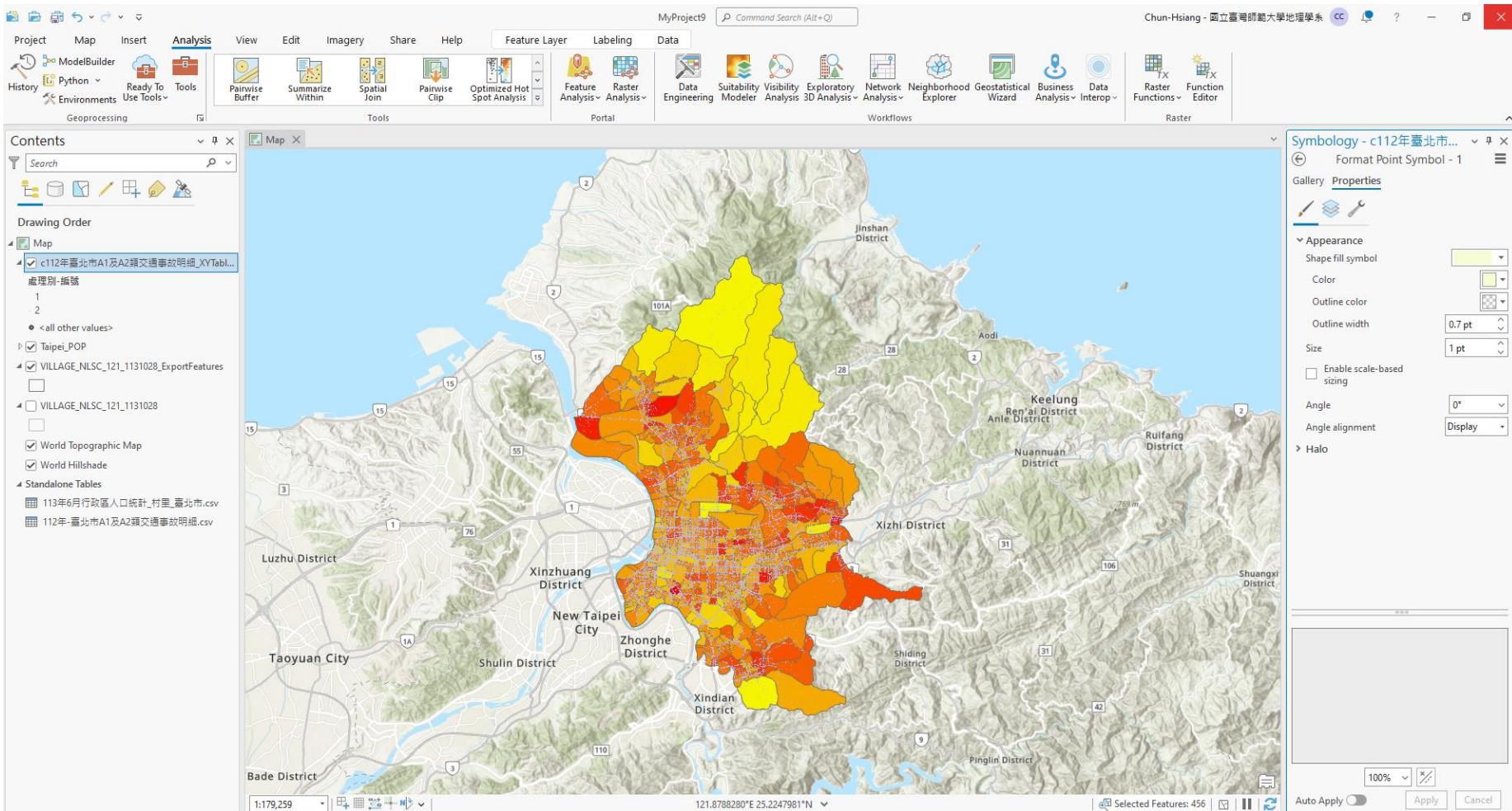
# Taipei Population Data



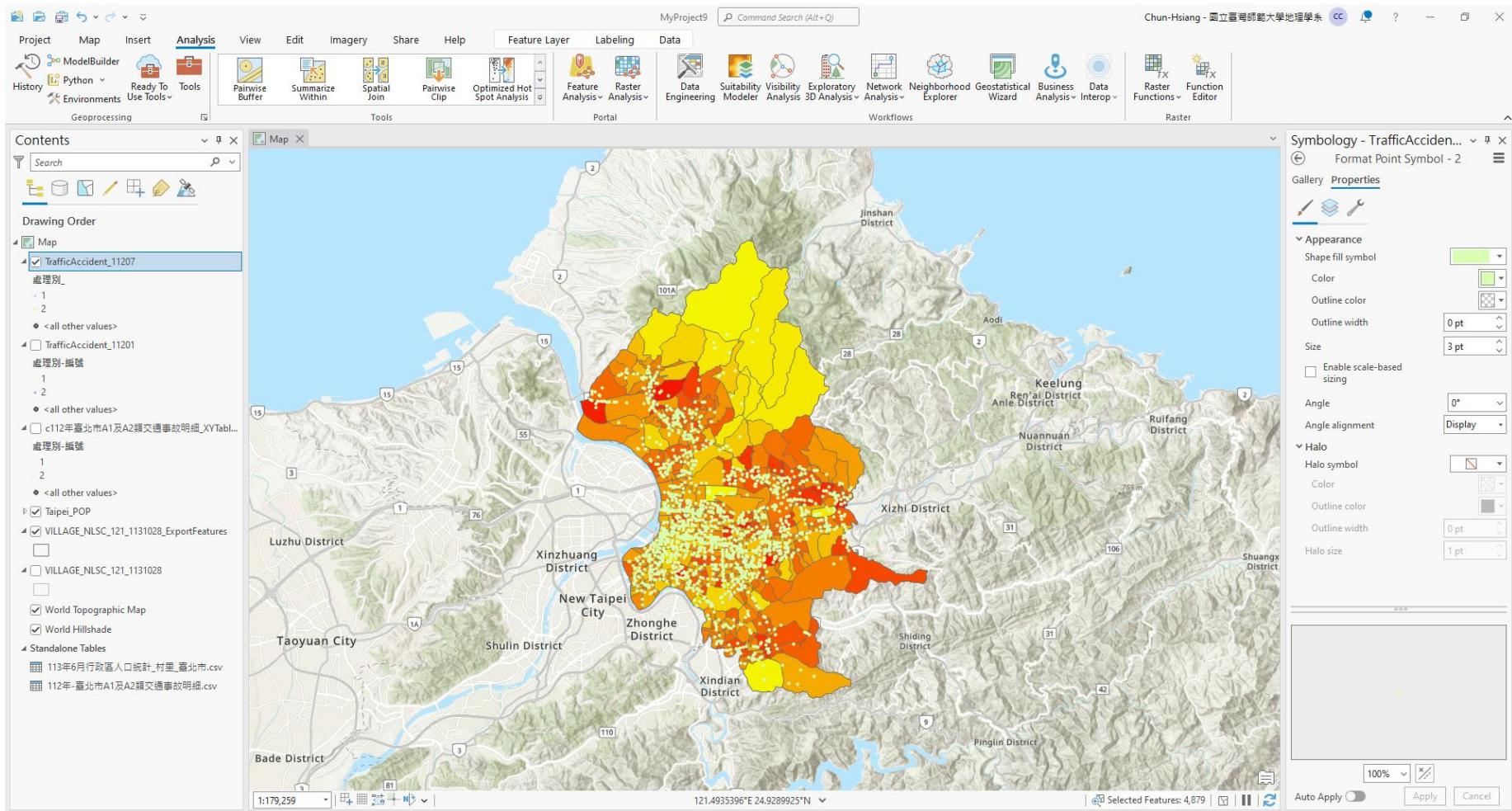
# Overlay with Traffic Accident Data



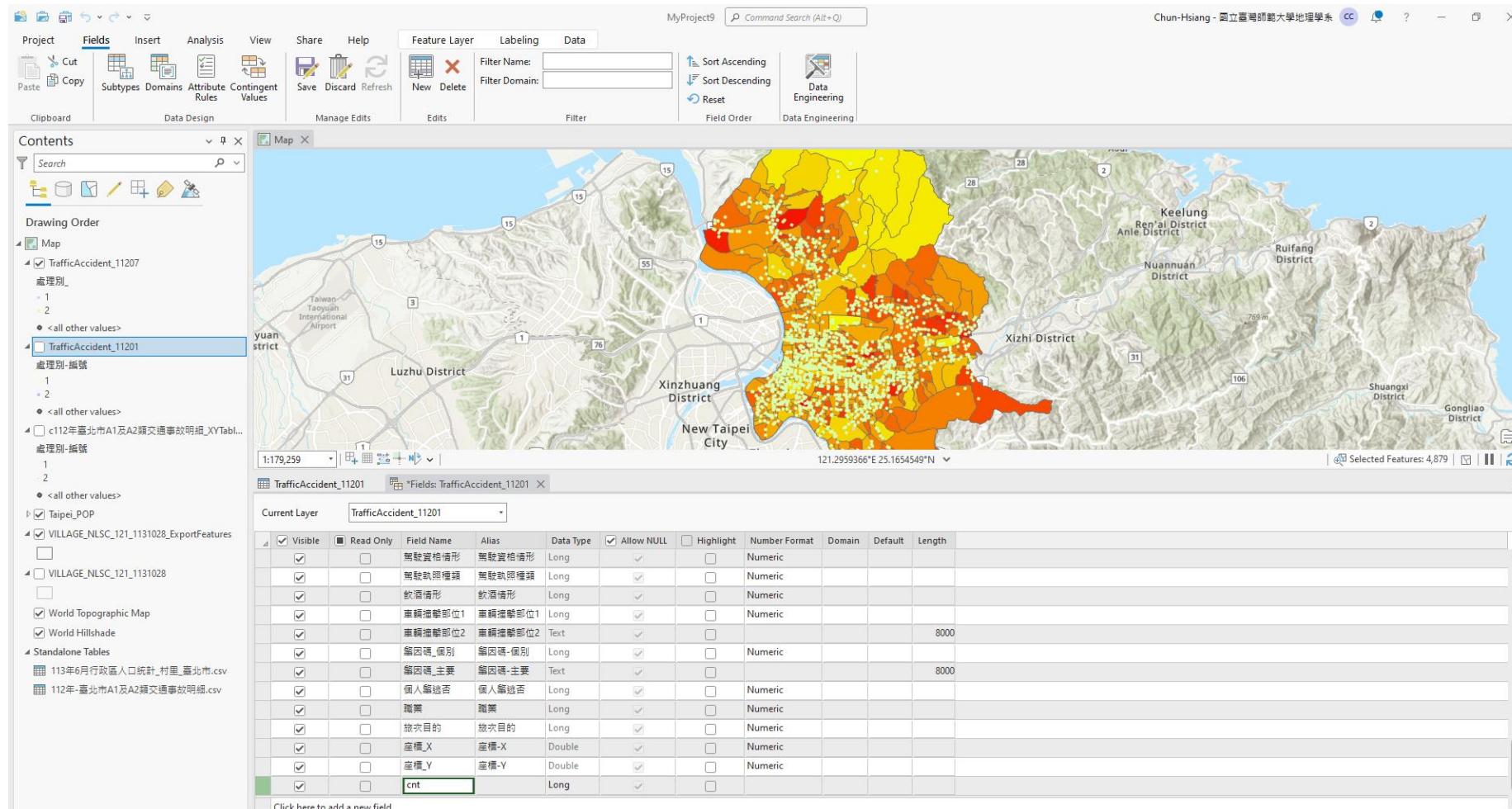
# Overlay with Traffic Accident Data



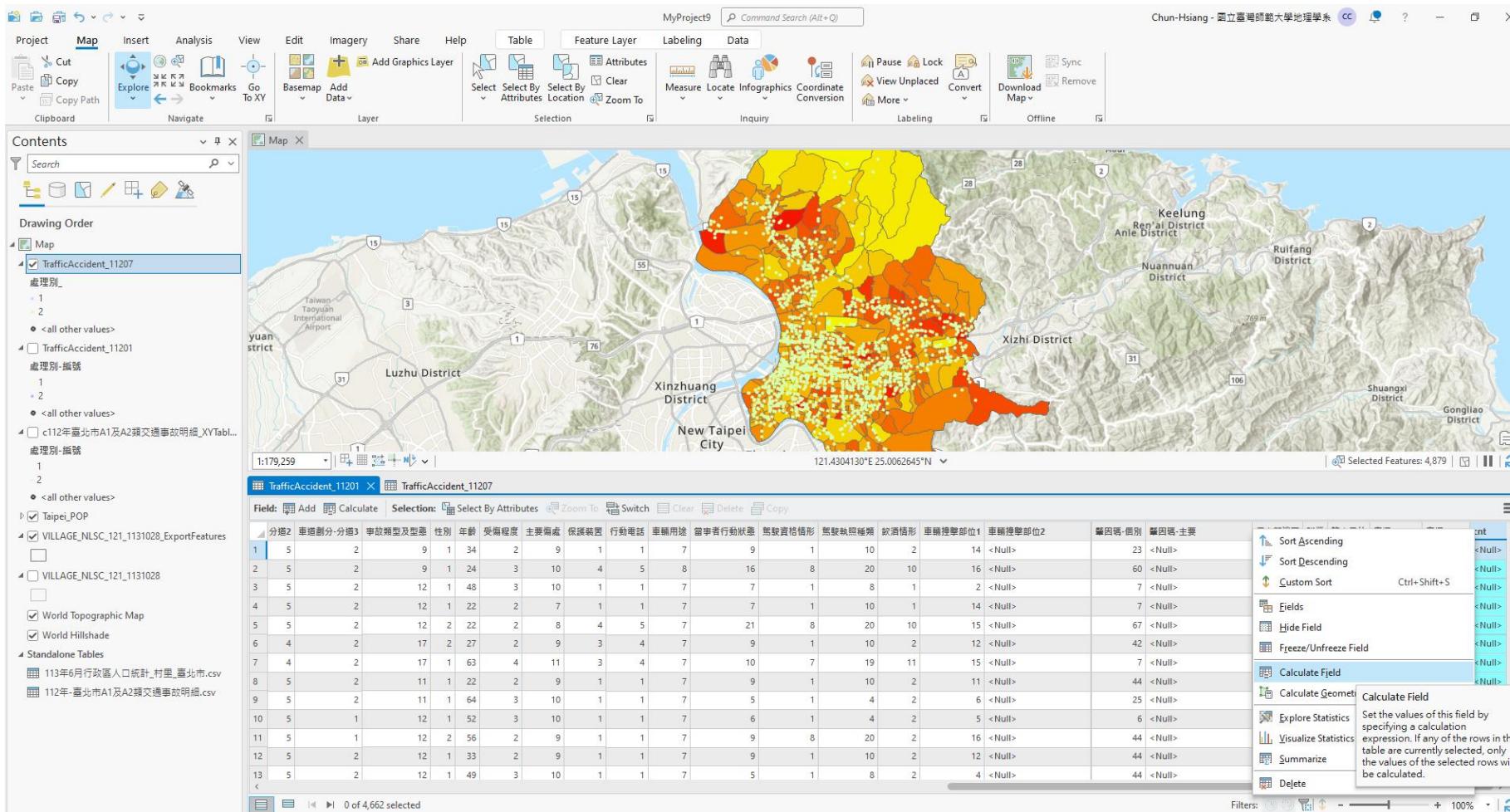
# Overlay with Traffic Accident Data



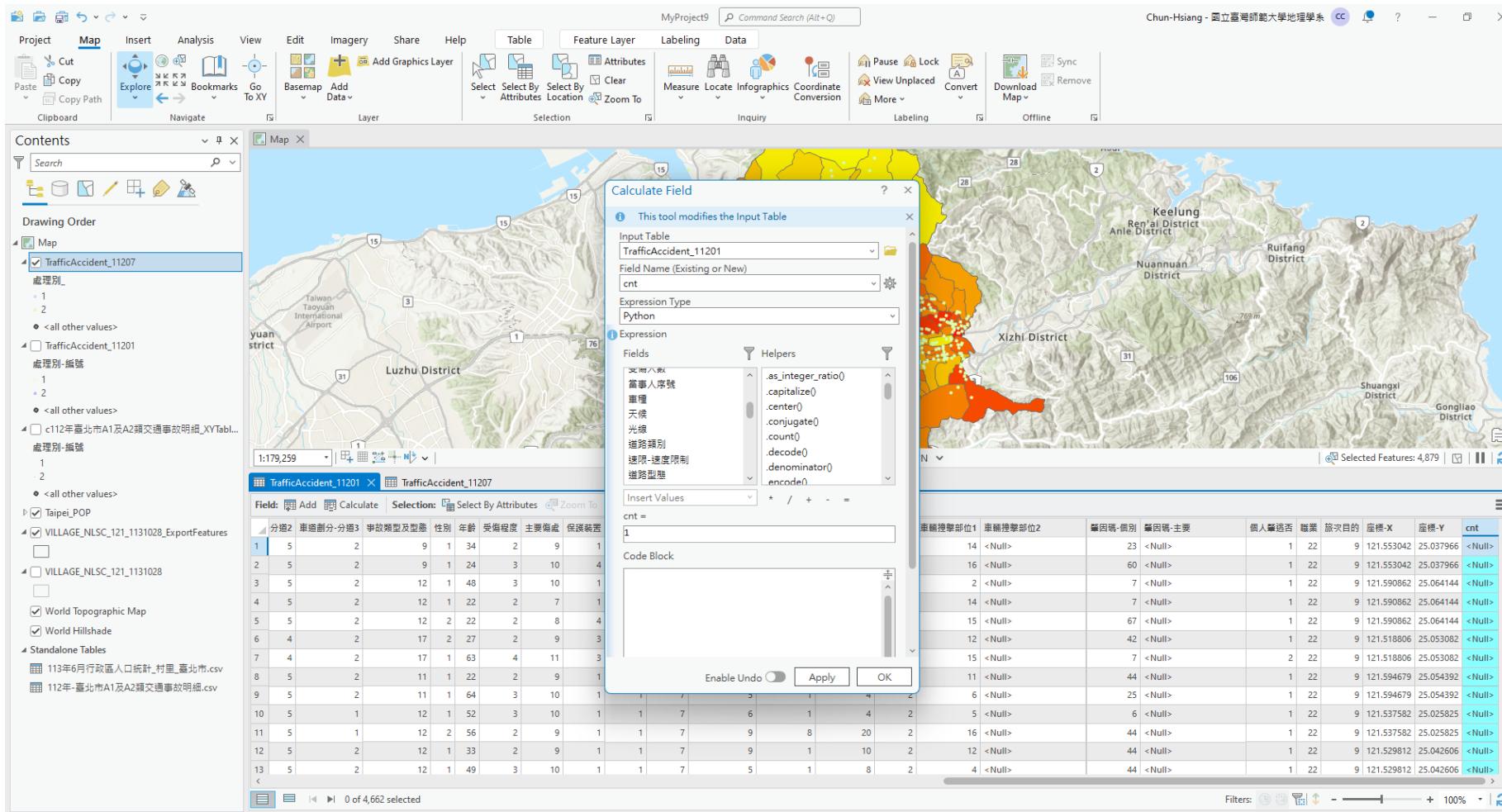
# Add a New Field "cnt" to both 11201 & 11207



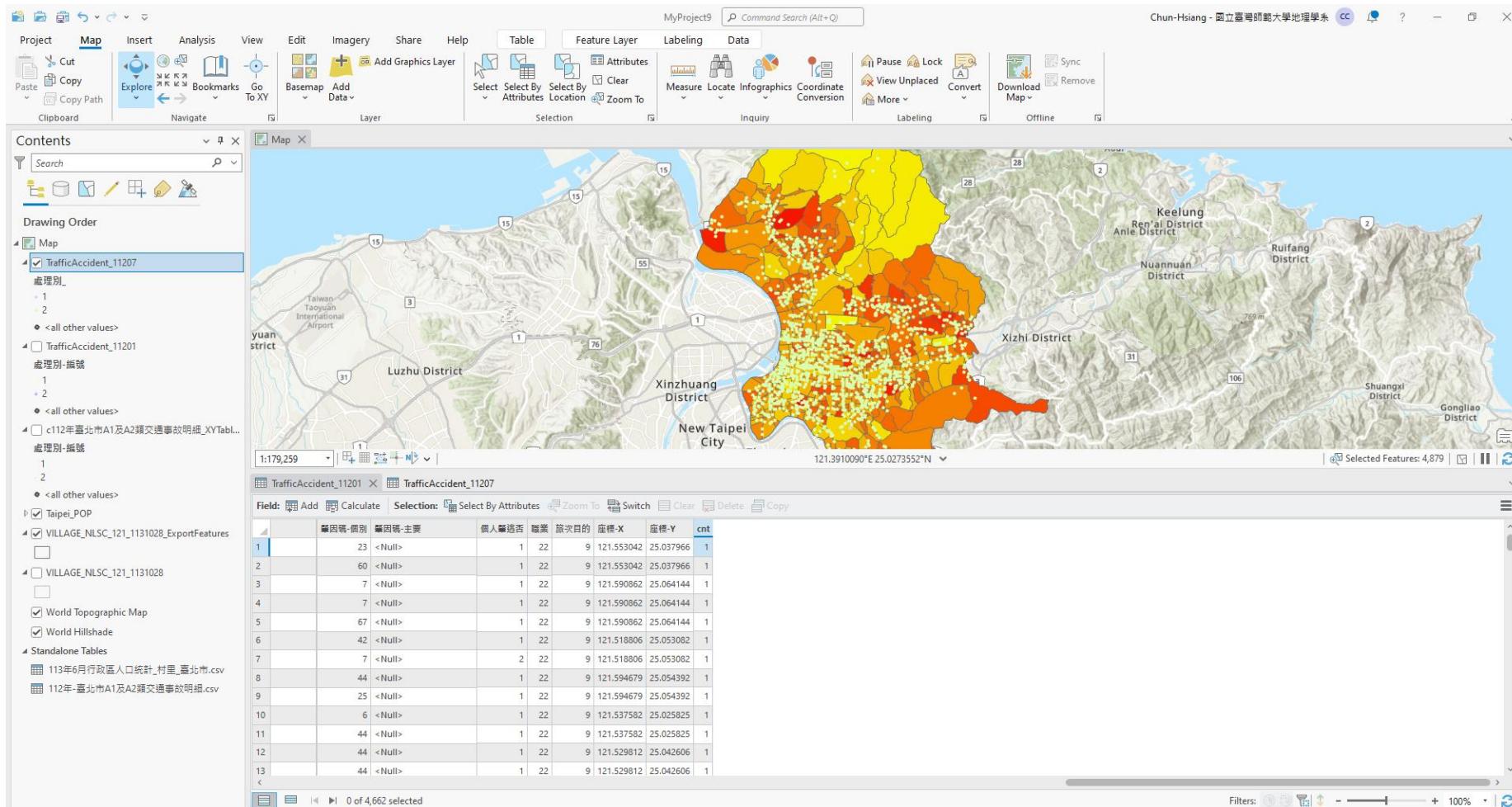
# Fill 1 into “cnt” Field to both 11201 & 11207



# Fill 1 into “cnt” Field to both 11201 & 11207



# Fill 1 into “cnt” Field to both 11201 & 11207

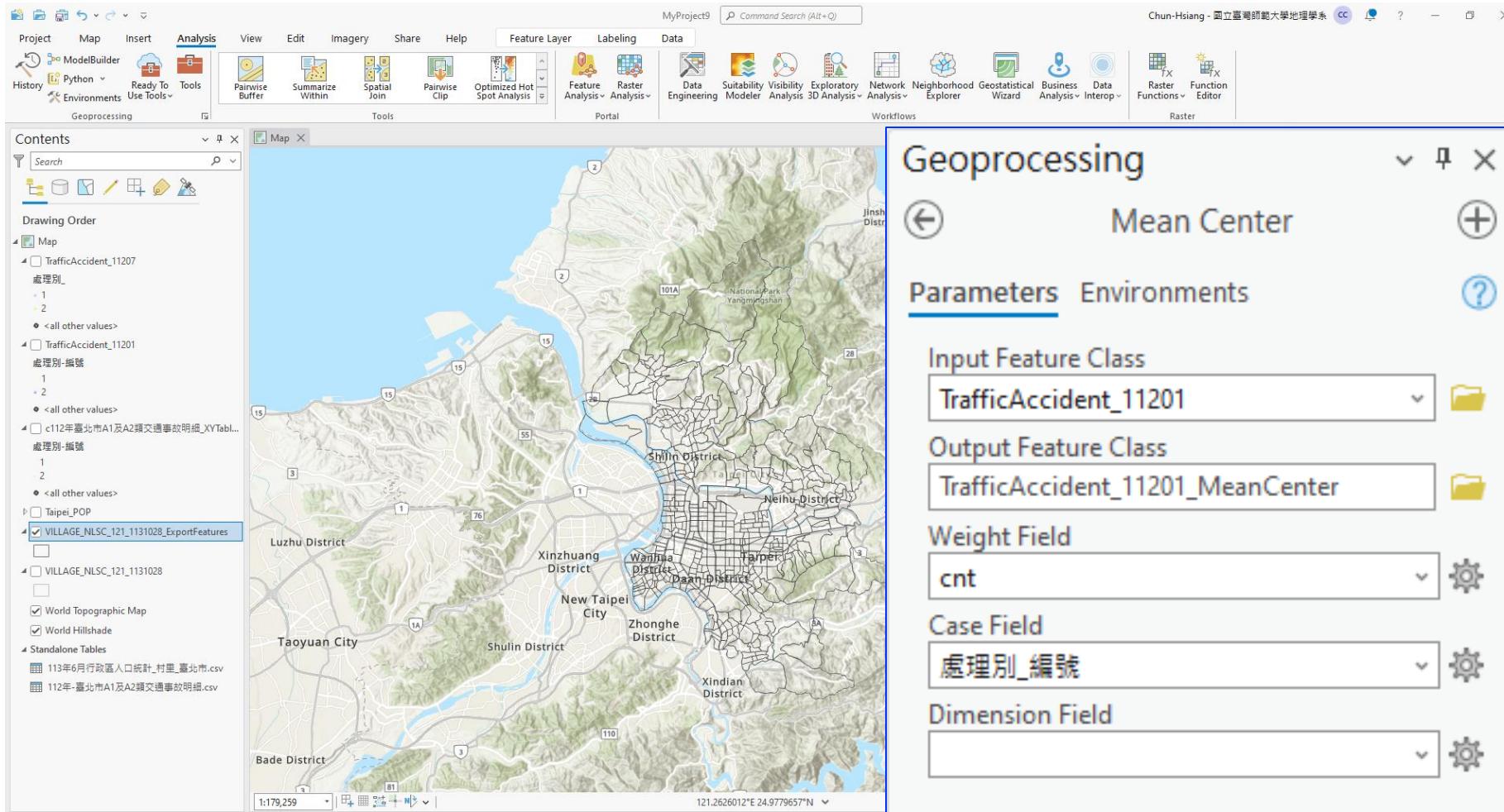


# Central Tendency Analysis

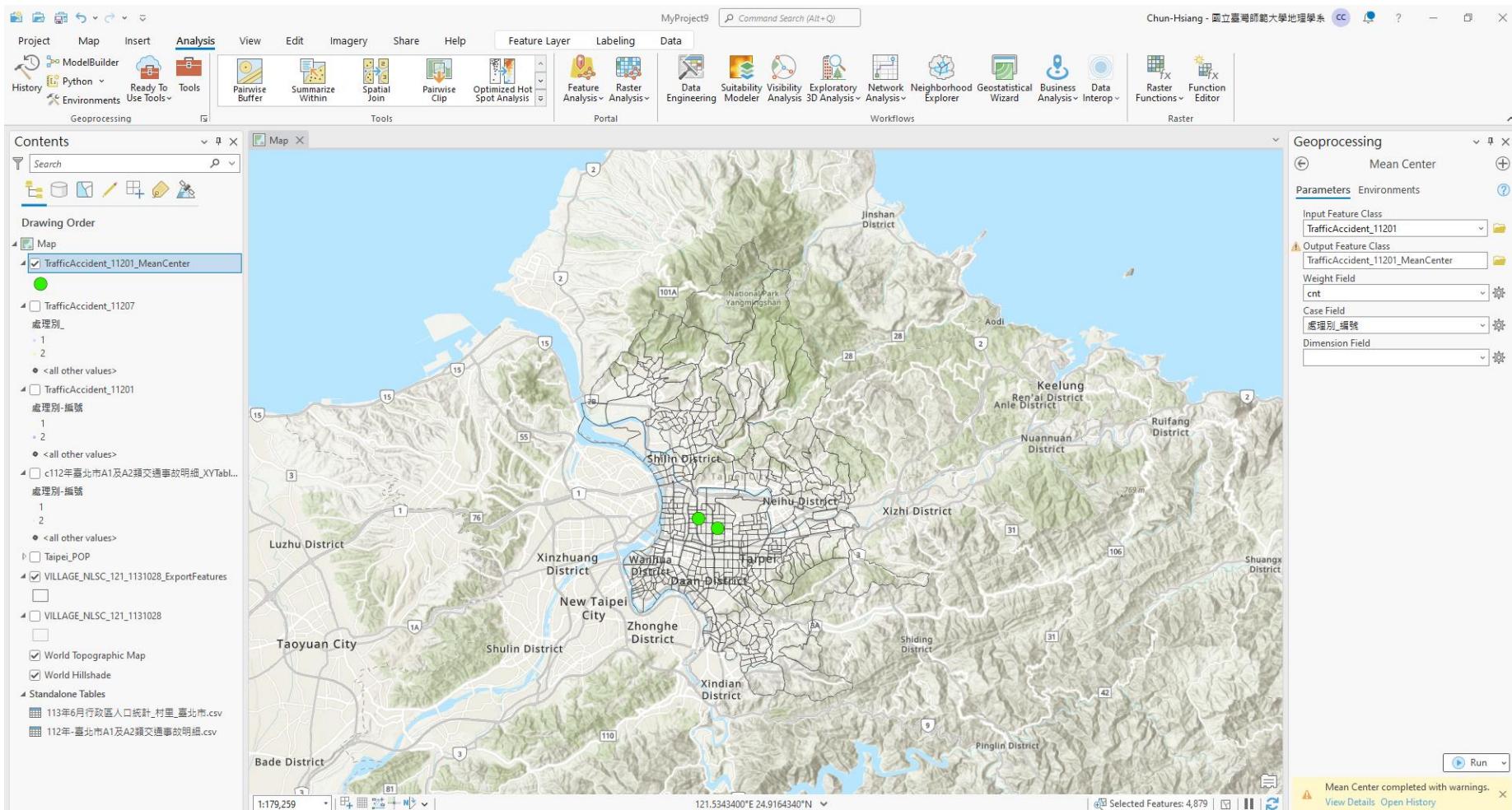
Compute the following functions with both TrafficAccident\_11201 and TrafficAccident\_11207

- 1) Mean Center
- 2) Median Center
- 3) Standard Distance
- 4) Central Feature
- 5) Directional Distribution

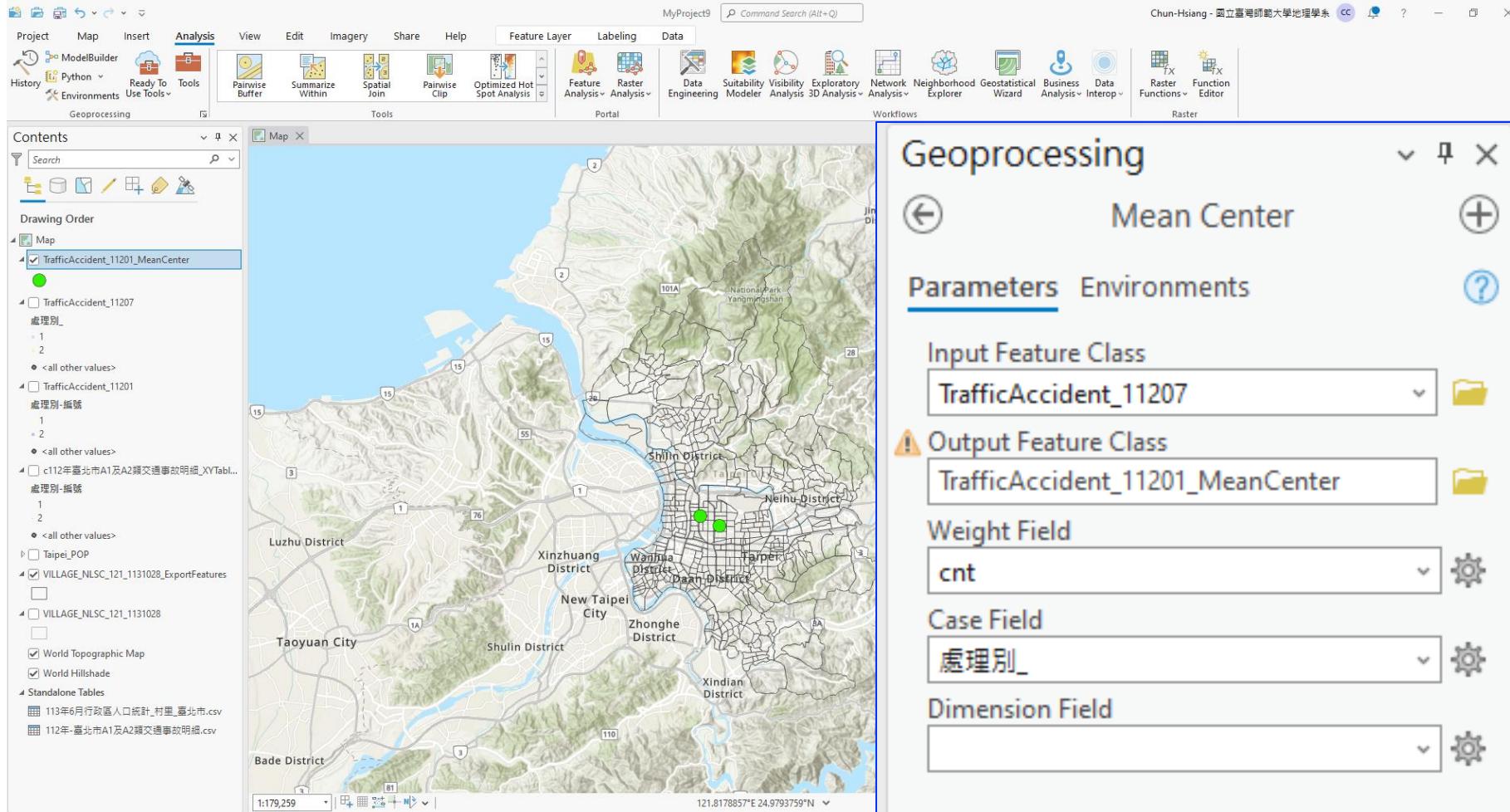
# Mean Center



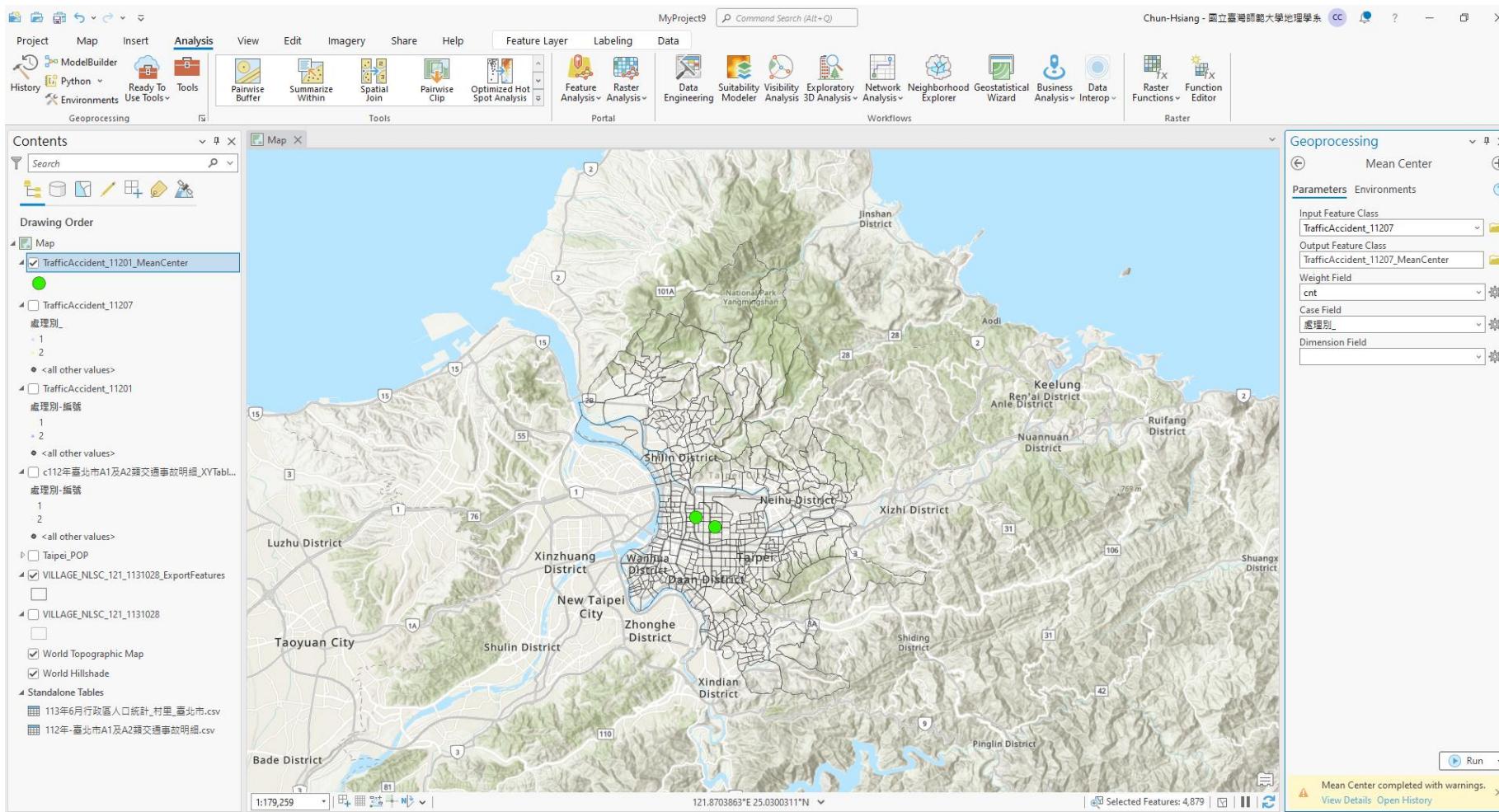
# Mean Center



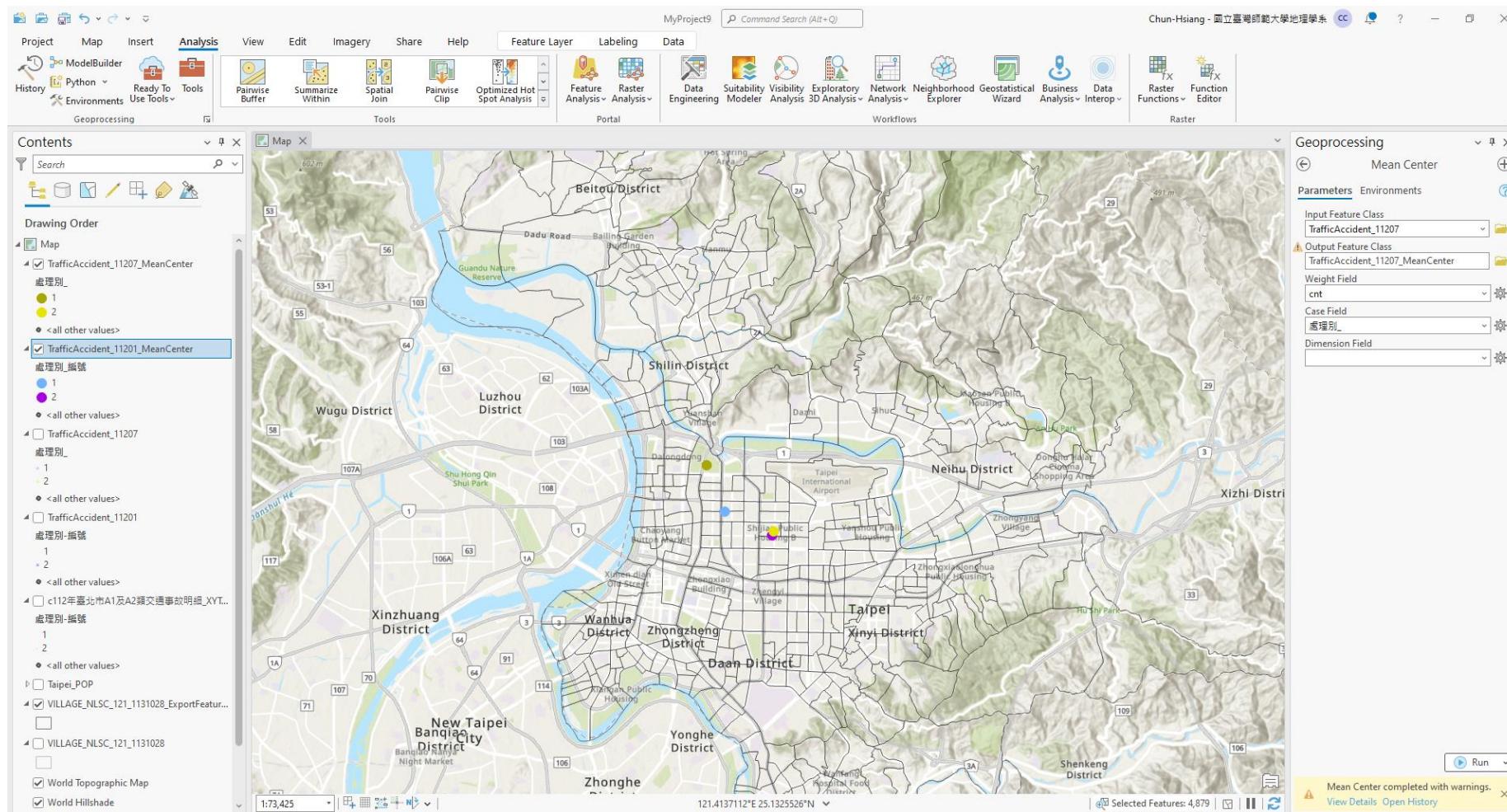
# Mean Center



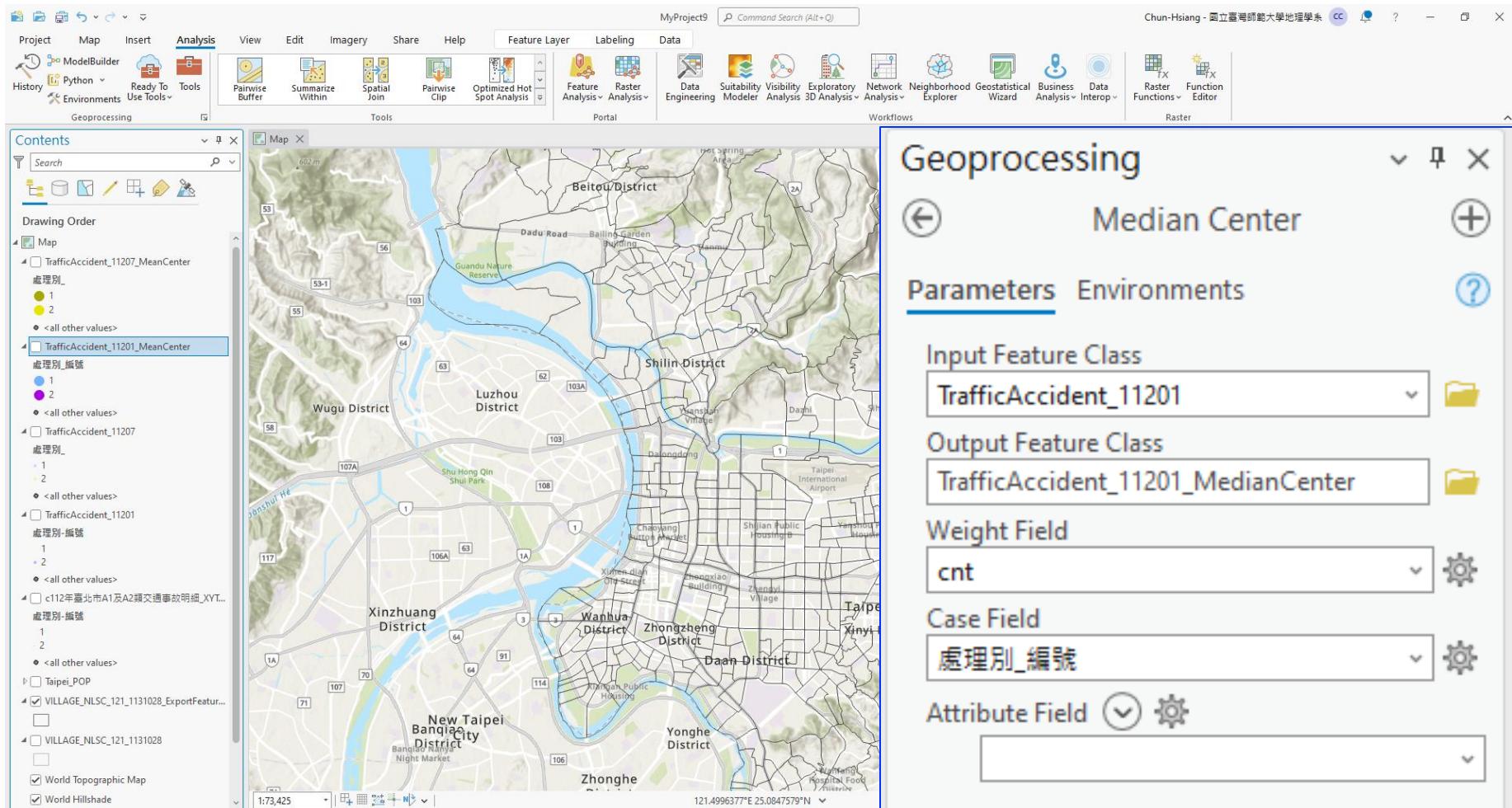
# Mean Center



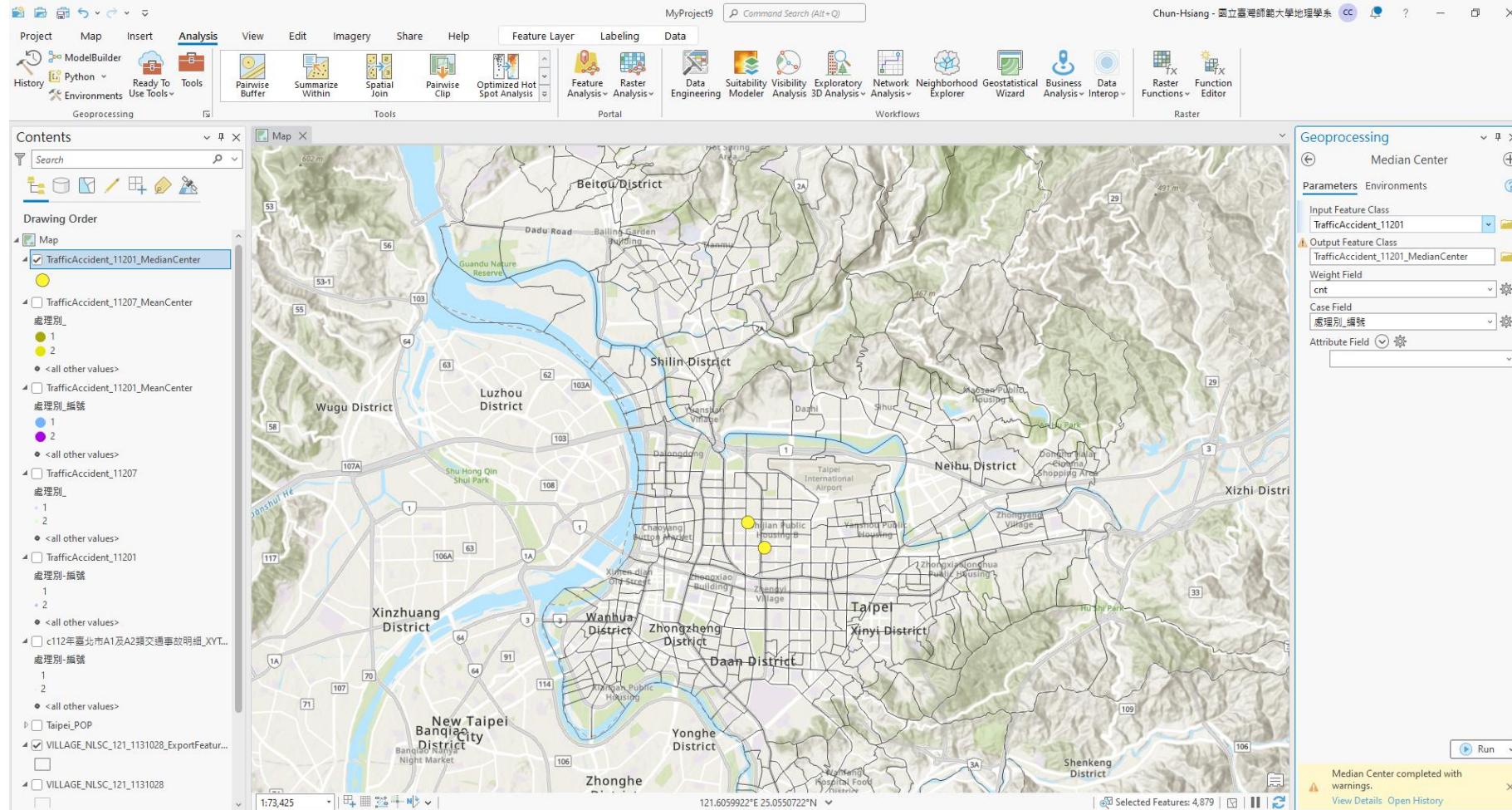
# Mean Center :: Symbology



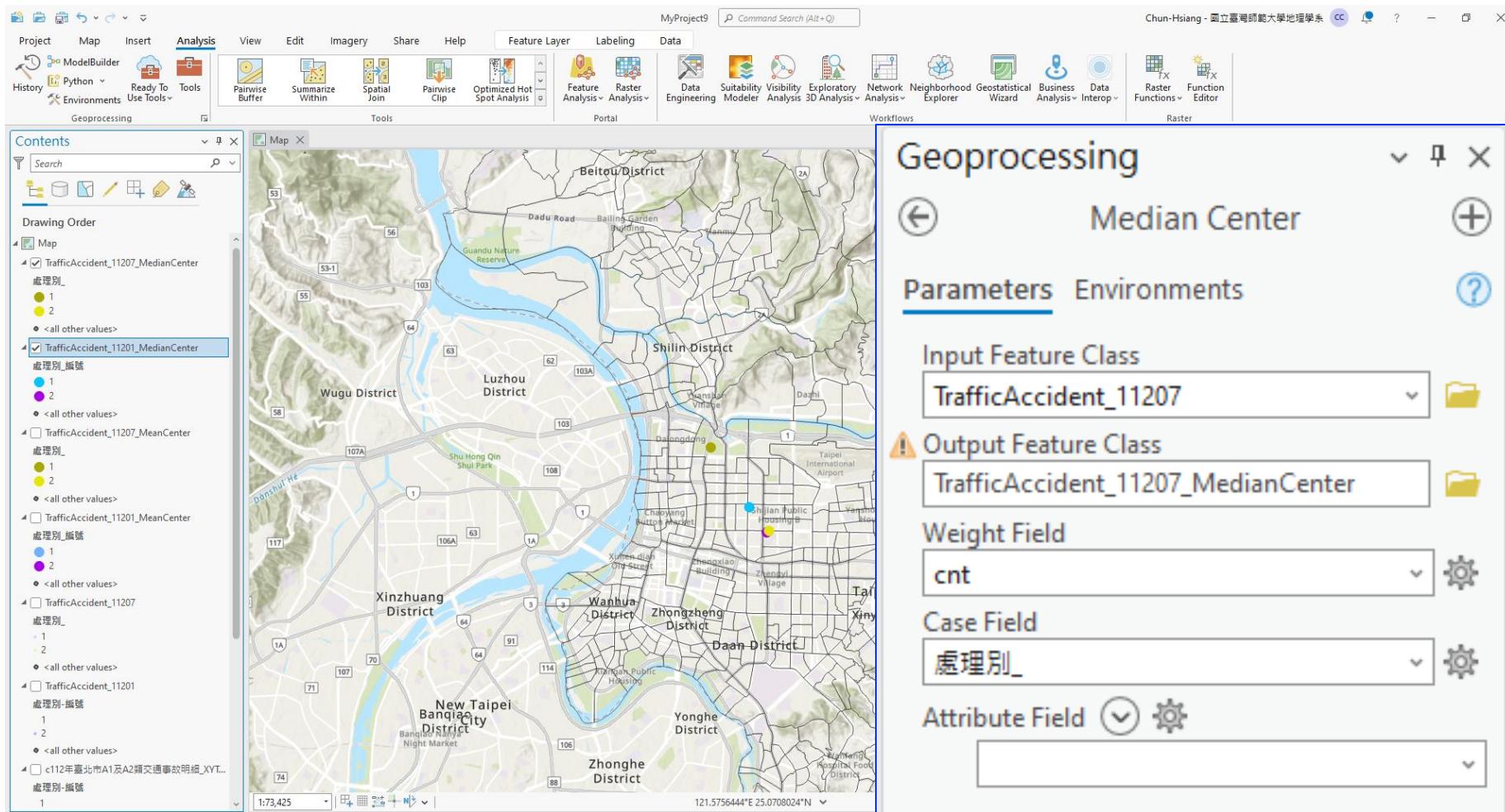
# Median Center



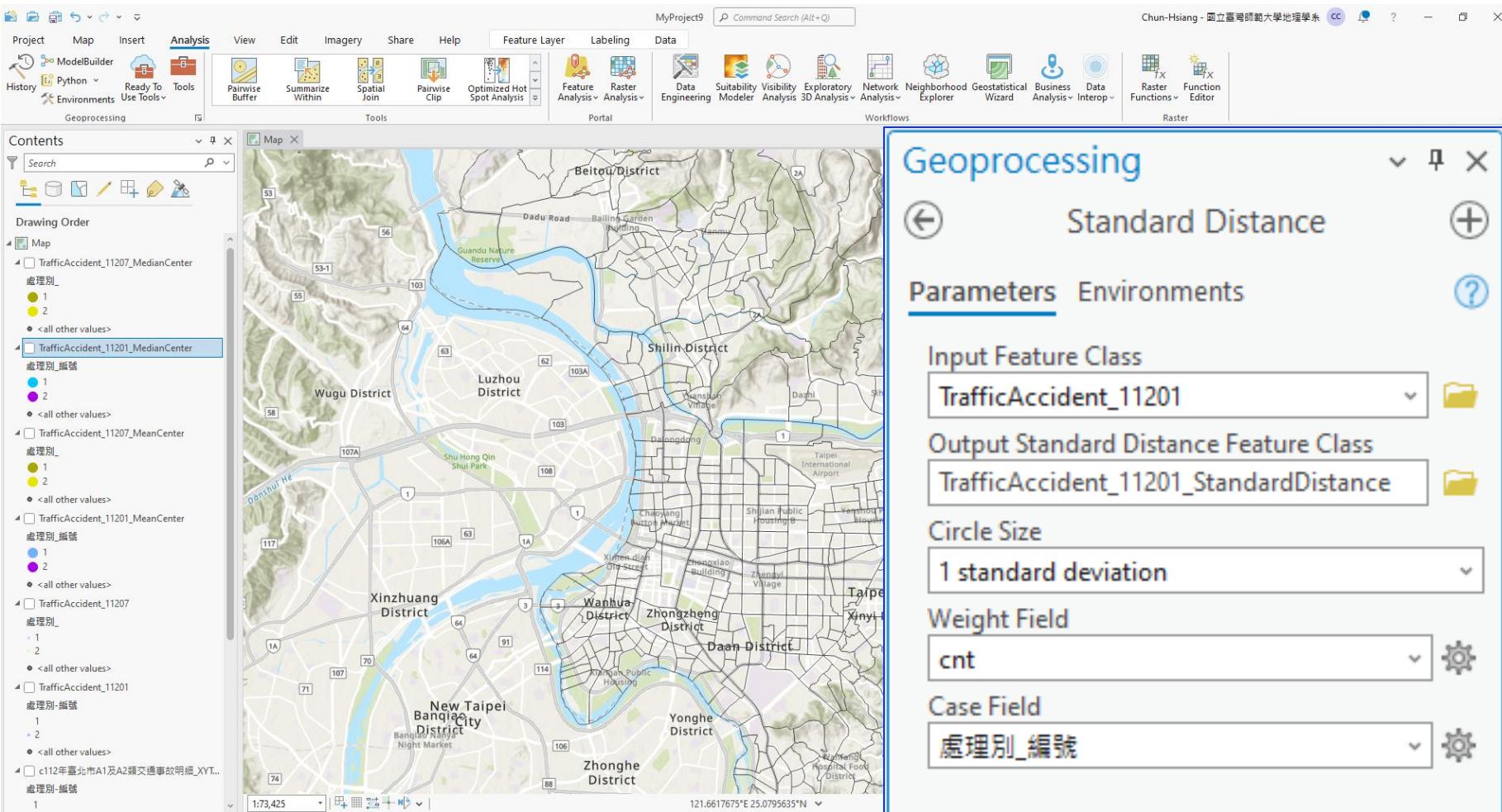
# Median Center



# Median Center :: Symbology



# Standard Distance



# Standard Distance

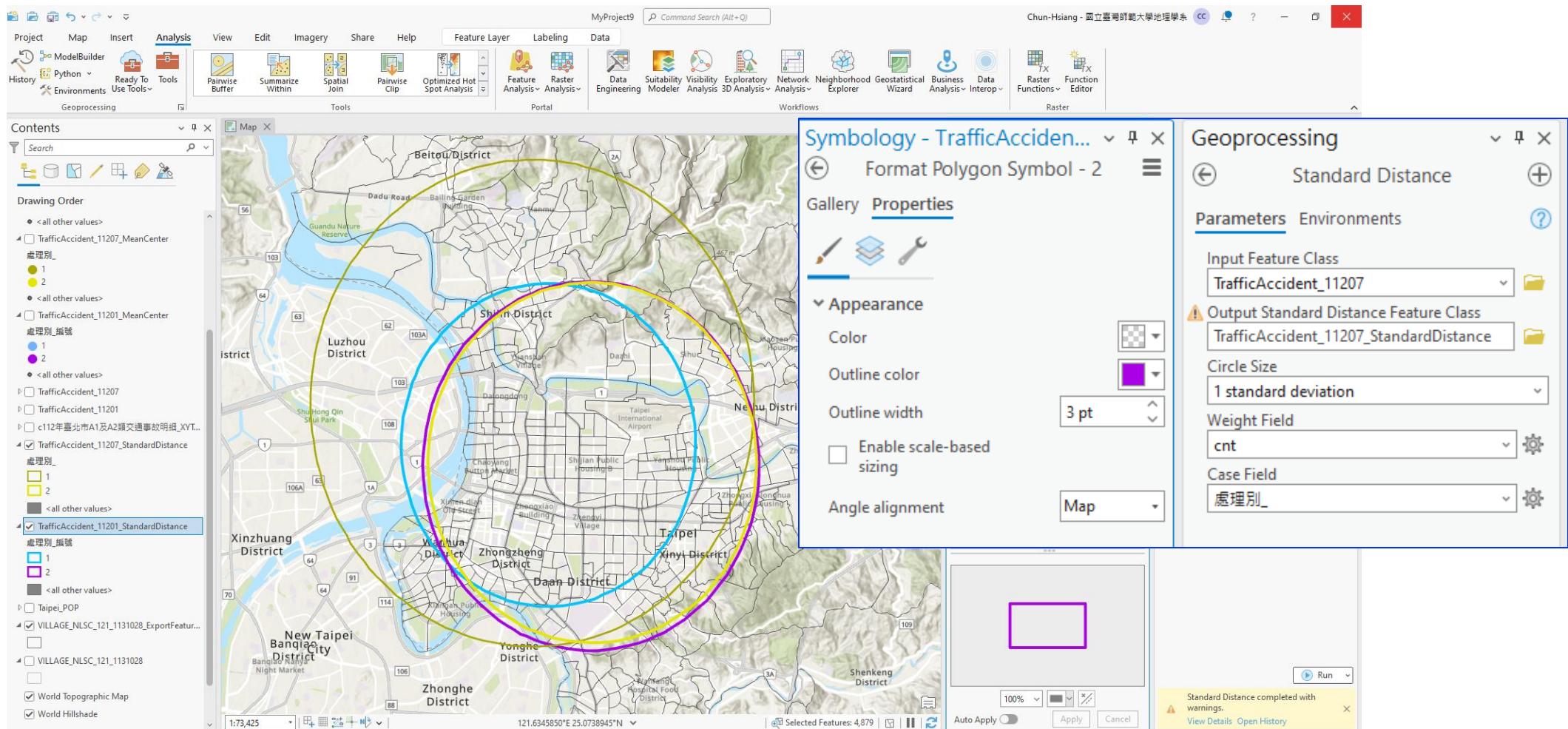
The screenshot shows the ArcGIS Pro interface with a map of Taipei, Taiwan, and a geoprocessing dialog box.

**Map View:** The main window displays a map of Taipei with several purple buffer zones overlaid, representing the "Standard Distance" analysis results. The map includes labels for districts like Beitou, Shulin, Wugu, Luzhou, Xinzhuang, New Taipei, and Daan, along with roads and landmarks.

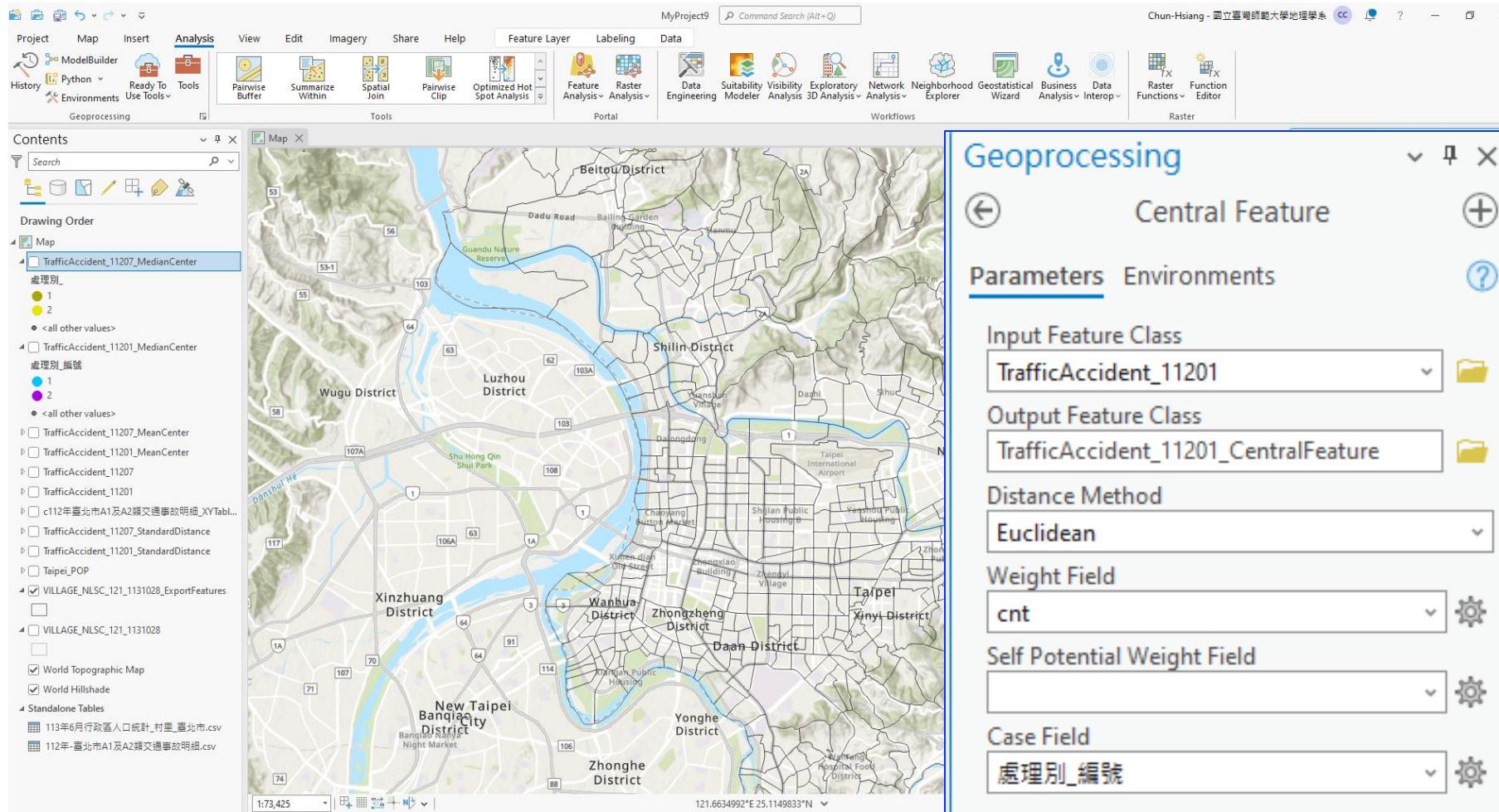
**Geoprocessing Dialog:** A dialog box titled "Geoprocessing" is open, specifically for the "Standard Distance" tool.

- Parameters:**
  - Input Feature Class:** TrafficAccident\_11201
  - Output Standard Distance Feature Class:** TrafficAccident\_11201\_StandardDistance
  - Circle Size:** 1 standard deviation
  - Weight Field:** cnt
  - Case Field:** 處理別\_編號
- Environments:** This tab is partially visible on the right side of the dialog.

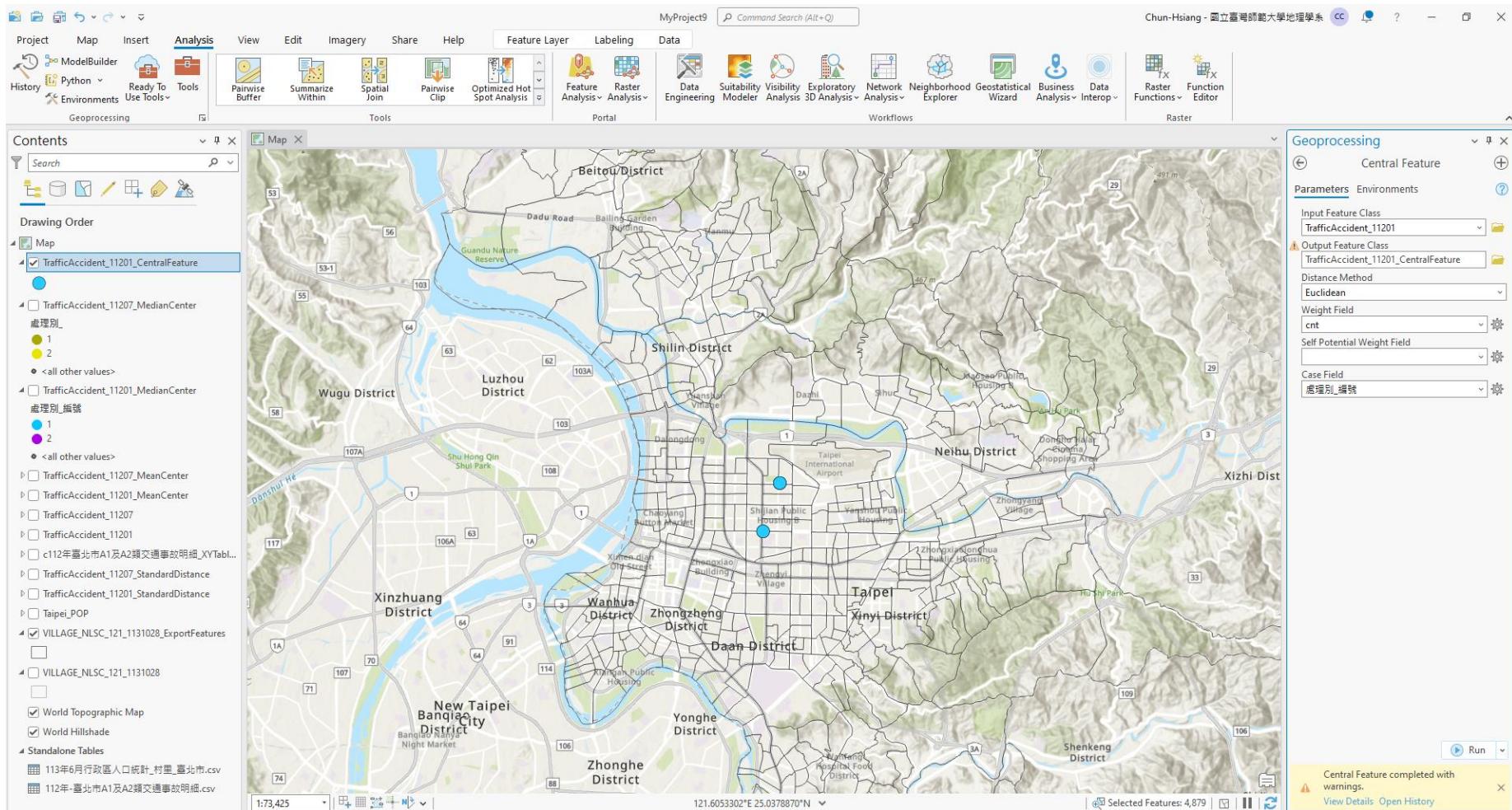
# Standard Distance :: Symbology



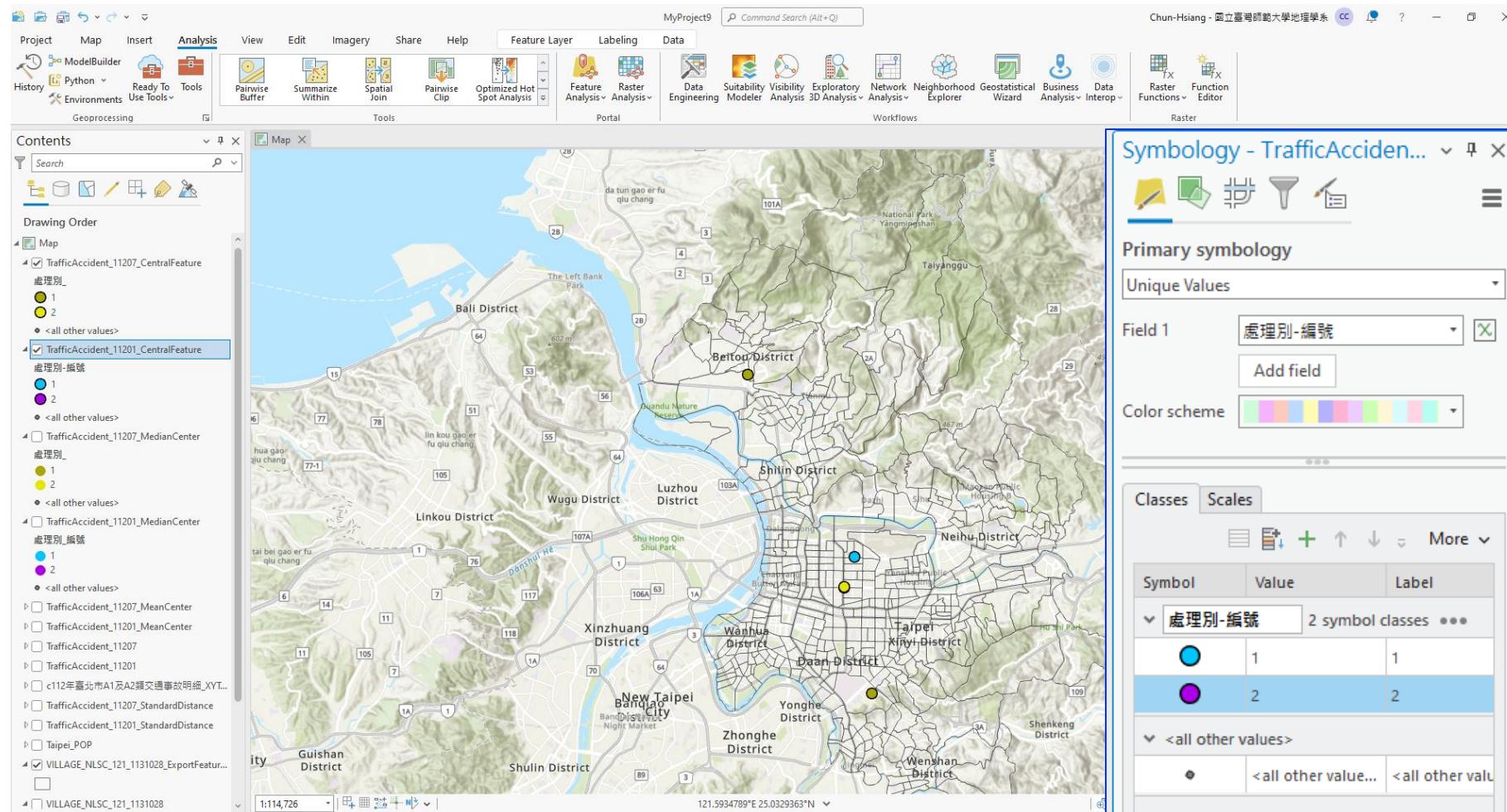
# Central Feature



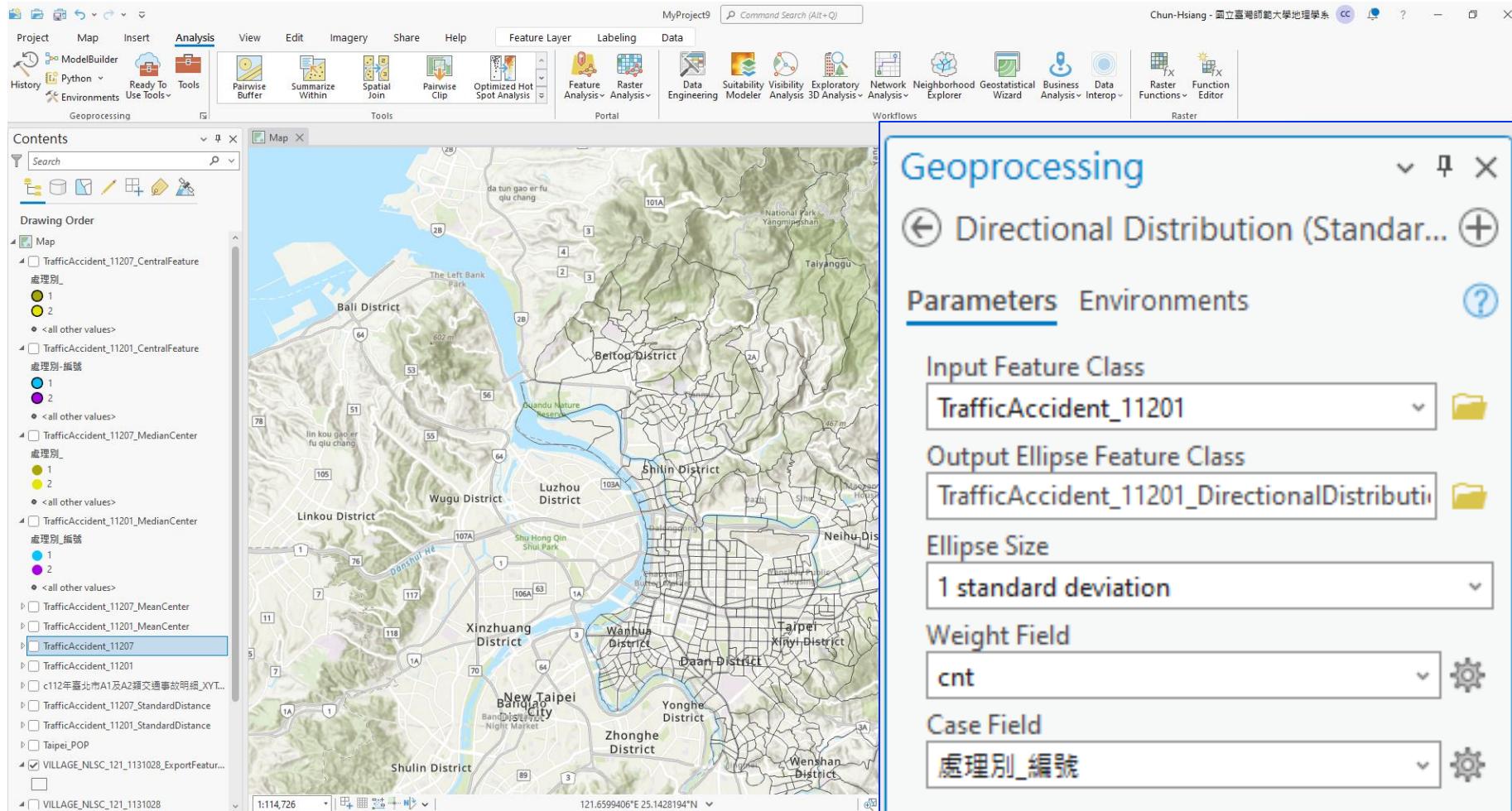
# Central Feature



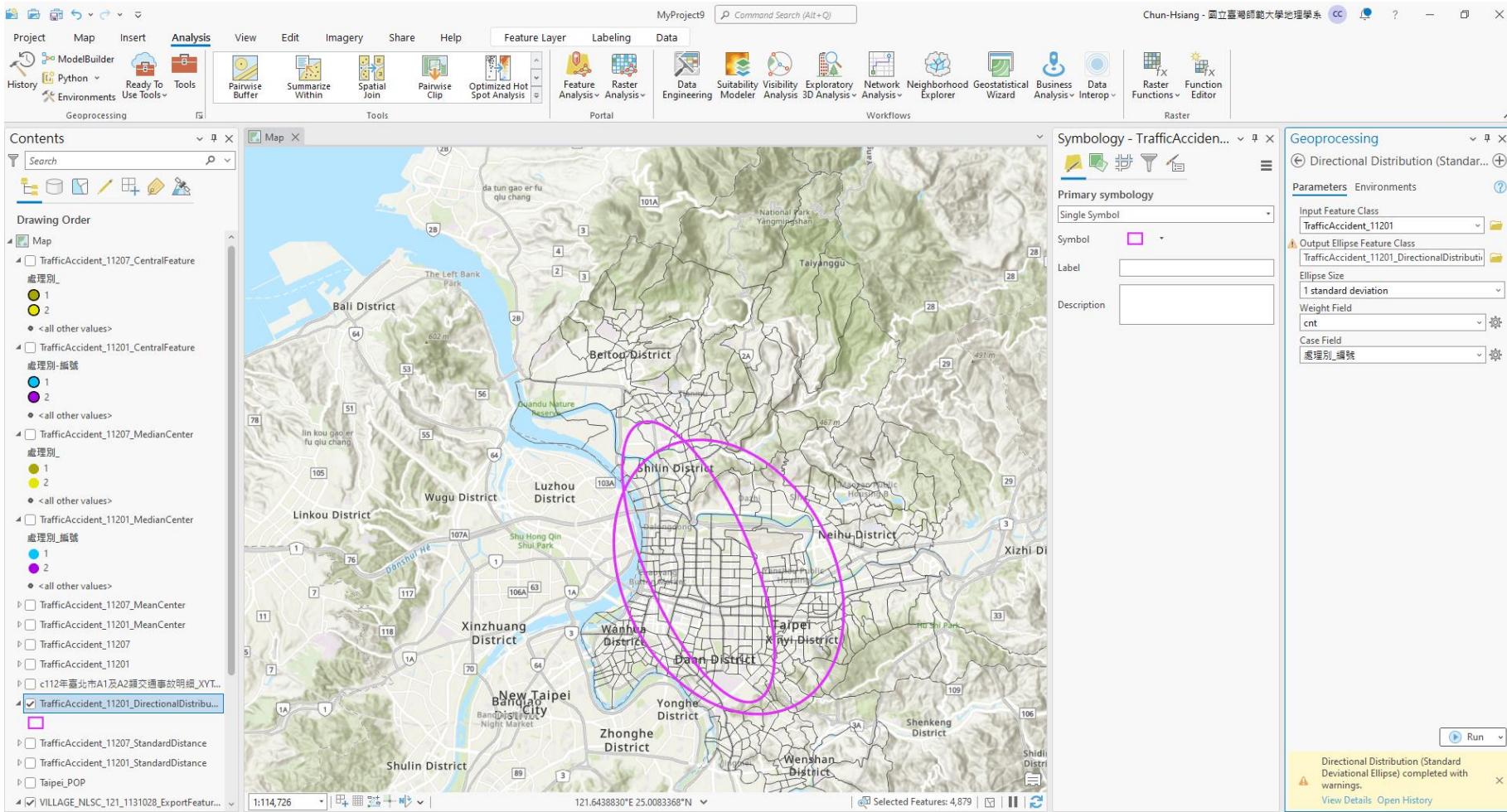
# Central Feature :: Symbology



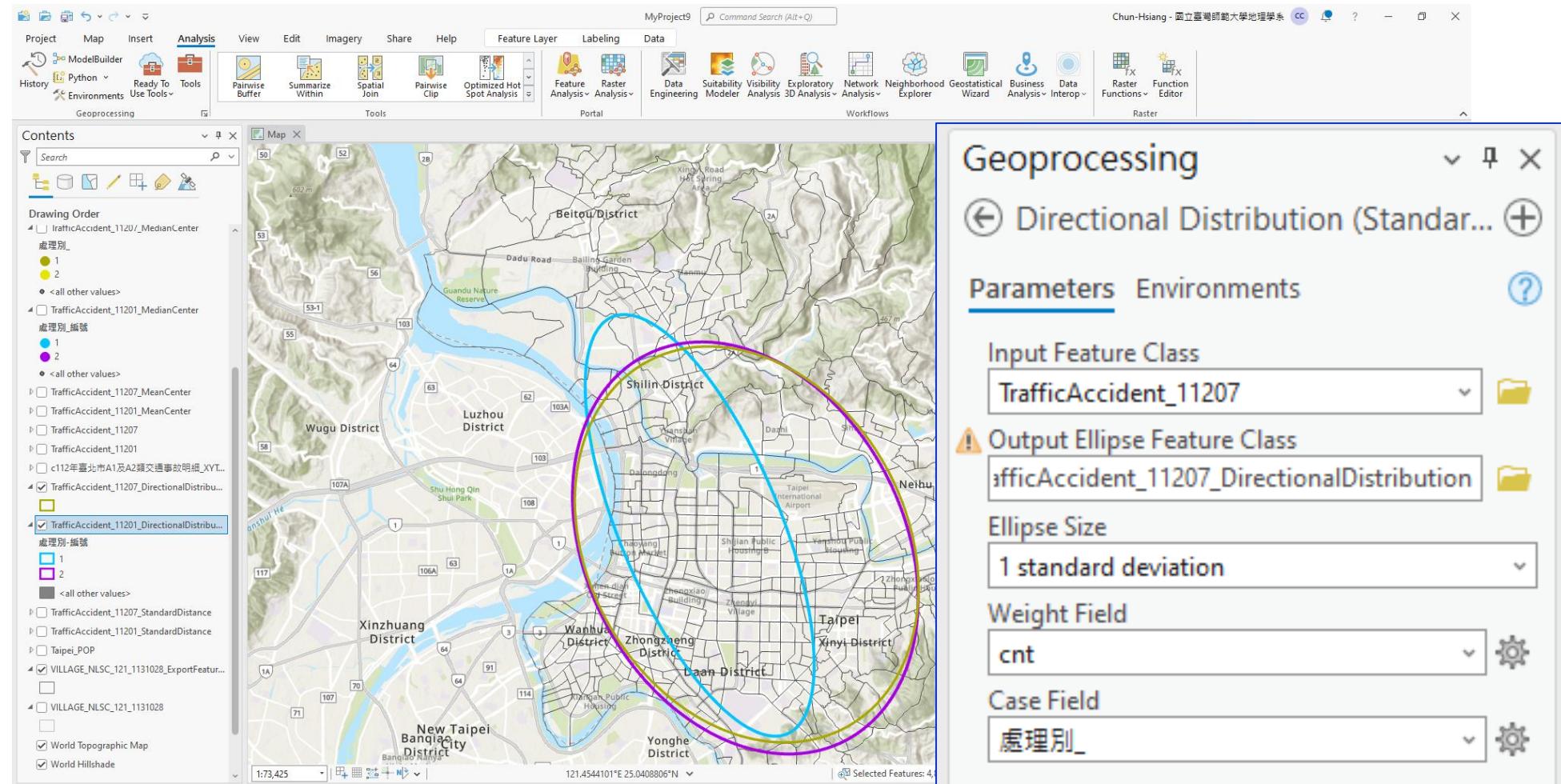
# Directional Distribution



# Directional Distribution



# Directional Distribution :: Symbology



# Spatial Statistics Analysis

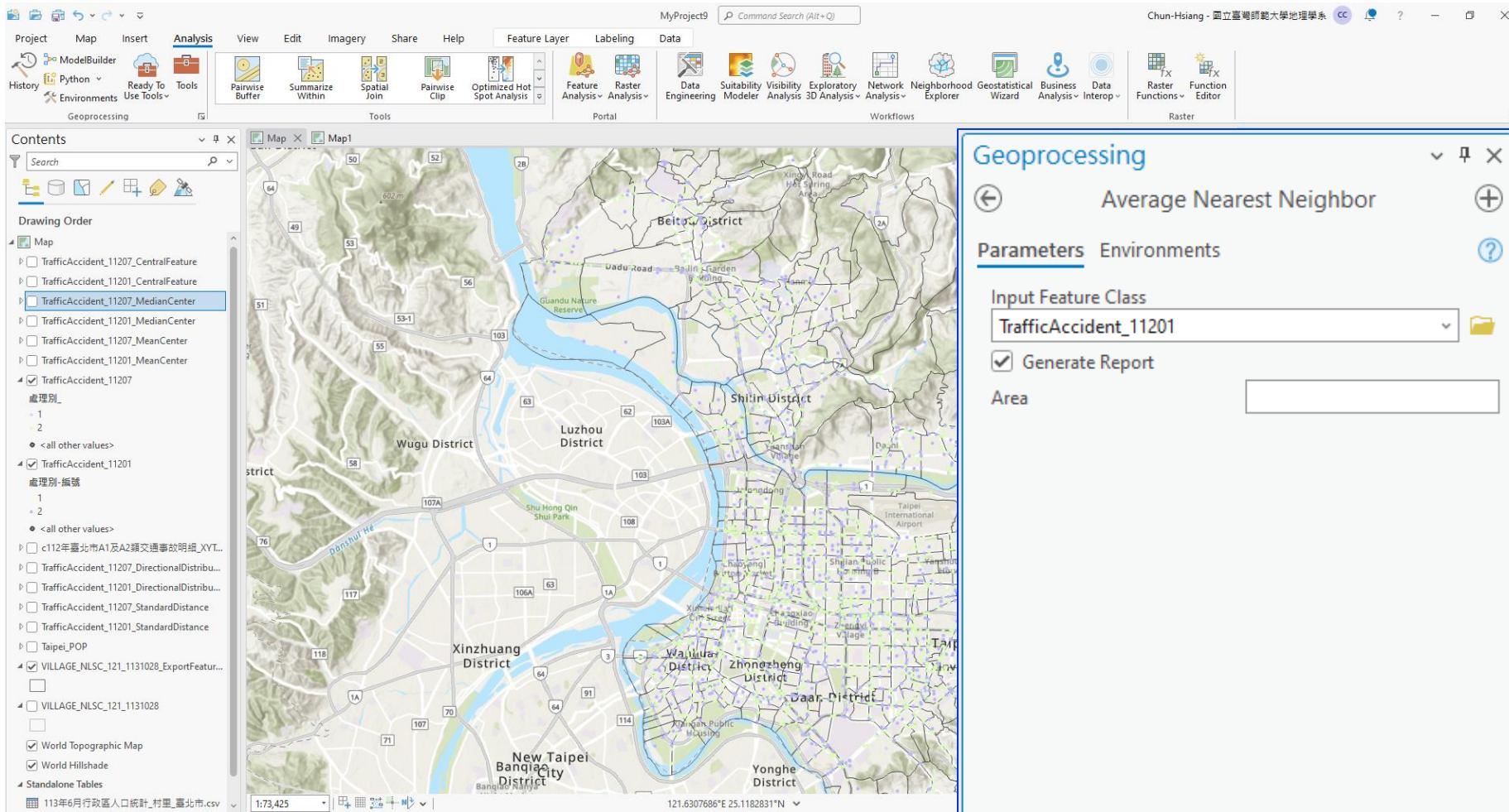
Compute the following function with both TrafficAccident\_11201 and TrafficAccident\_11207

- 1) Average Nearest Neighbor

Compute the following functions with the population data from Taipei POP data.

- 1) Incremental Spatial Autocorrelation
- 2) High/Low Clustering (Getis-Ord General G)
- 3) Repley's  $k$ -function
- 4) Spatial Autocorrelation (Global Moran's I)

# Average Nearest Neighbor



# Average Nearest Neighbor

The screenshot displays the ArcGIS Pro interface with the 'Analysis' tab selected. A central window shows the 'Average Nearest Neighbor (Spatial Statistics Tools)' dialog box. The dialog box contains the following information:

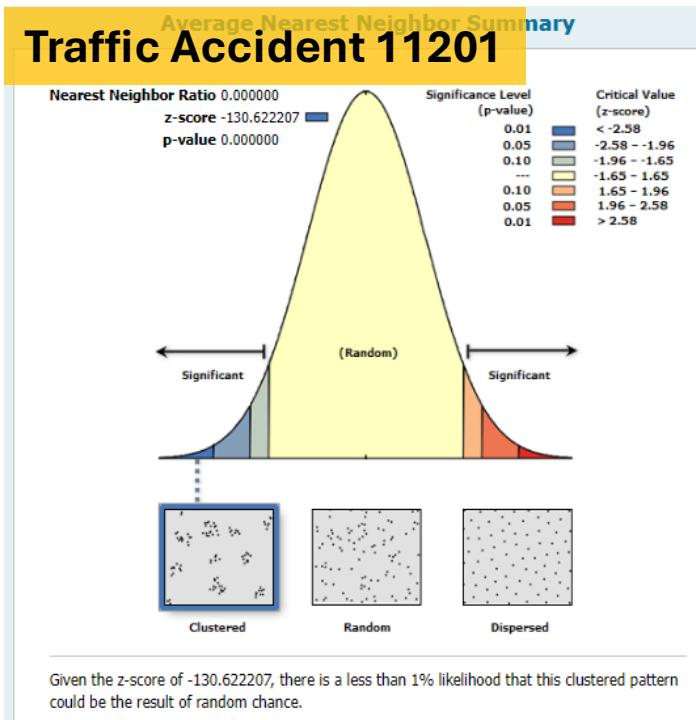
- Started:** Today at 上午 04:08:11
- Completed:** Today at 上午 04:08:12
- Elapsed Time:** 1 Second
- WARNING 001605:** Distances for Geographic Coordinates (degrees, minutes, seconds) are analyzed using Chordal Distances in meters.
- Messages (4):**
  - Start Time: 2024年11月13日 上午 04:08:11
  - WARNING 001605: Distances for Geographic Coordinates (degrees, minutes, seconds) are analyzed using Chordal Distances in meters.
- Average Nearest Neighbor Summary:**

Observed Mean Distance	0.00000
Expected Mean Distance	134.911242
Nearest Neighbor Ratio	0.00000
z-score	-130.622207
p-value	0.00000

Distance measured in meters  
Writing html report....  
[D:\TooDou\GIS\W08\MyProject9\NearestNeighbor\\_Result\\_53124\\_20400.html](D:\TooDou\GIS\W08\MyProject9\NearestNeighbor_Result_53124_20400.html)
- Succeeded at:** 2024年11月13日 上午 04:08:12 (Elapsed Time: 1.79 seconds)

The background map shows the Wugu District, Xinzhuan District, and New Banqiao District of Taipei, Taiwan, with various roads and landmarks labeled. The 'Geoprocessing' pane on the right shows the 'Average Nearest Neighbor' task has completed with warnings, and the 'Selected Features' count is 4,879.

# Average Nearest Neighbor

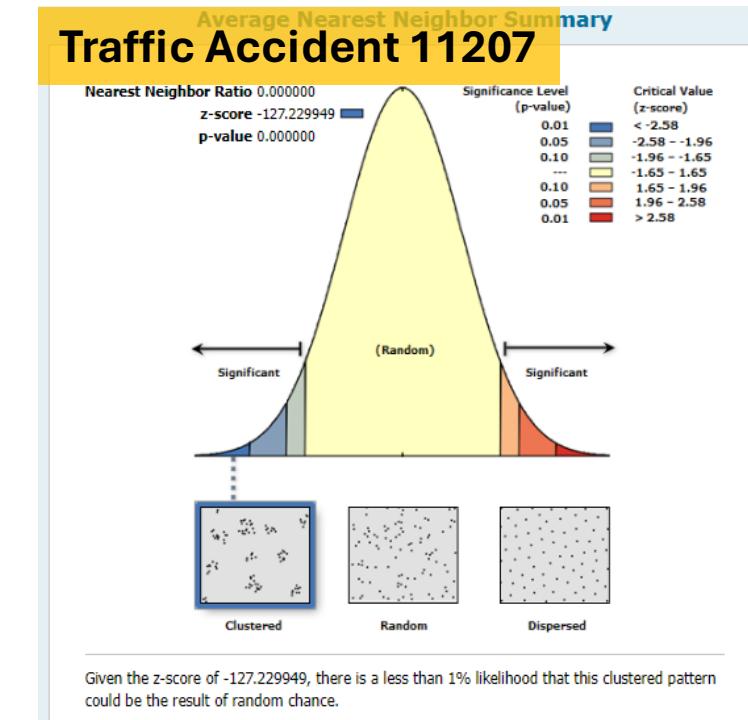


**Average Nearest Neighbor Summary**

Observed Mean Distance	0.0000 meters
Expected Mean Distance	134.9112 meters
Nearest Neighbor Ratio	0.000000
z-score	-130.622207
p-value	0.000000

**Dataset Information**

Input Feature Class:	TrafficAccident_11201
Distance Method:	EUCLIDEAN
Study Area:	339413055.219921
Selection Set:	False



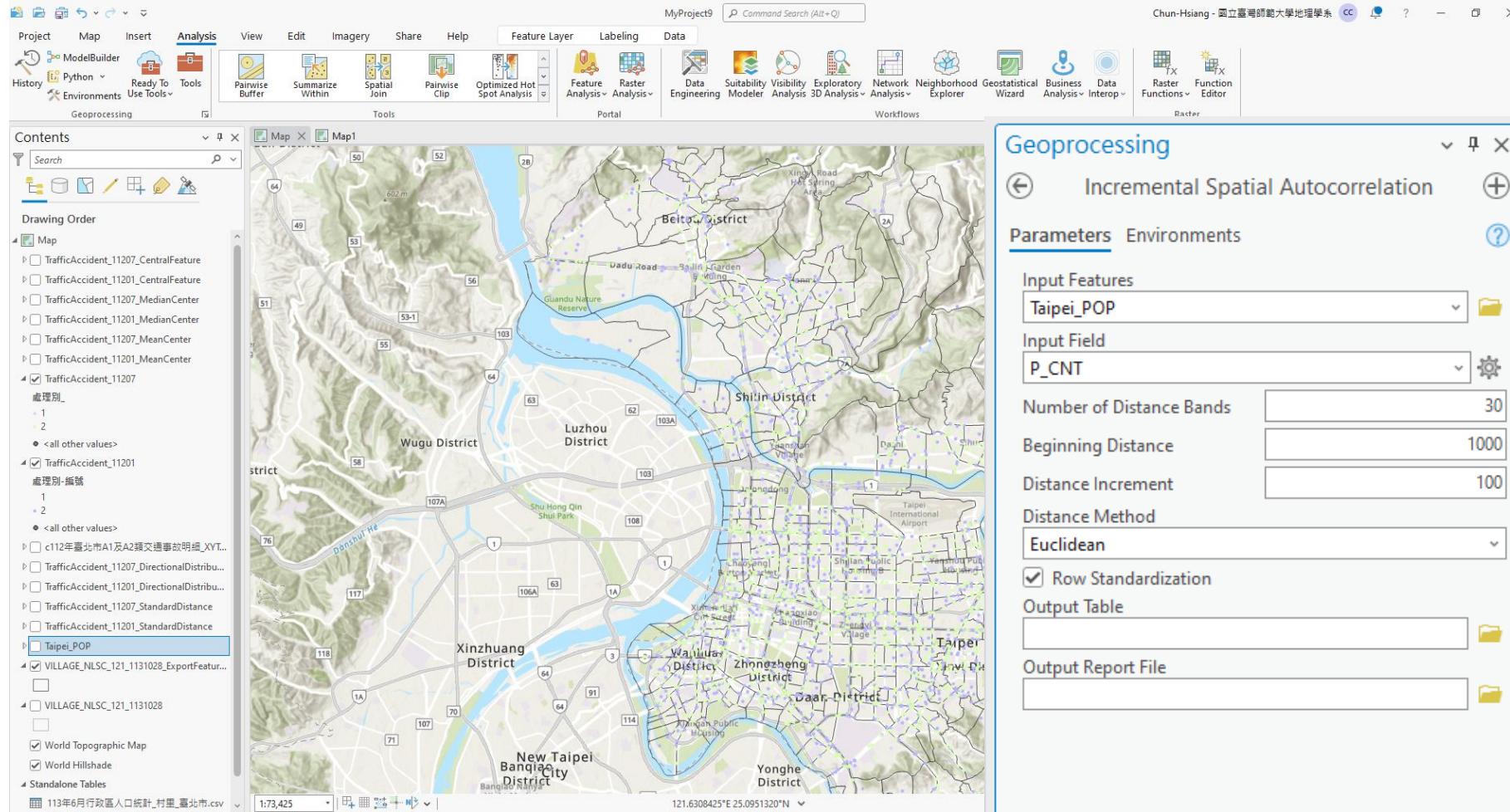
**Average Nearest Neighbor Summary**

Observed Mean Distance	0.0000 meters
Expected Mean Distance	137.7066 meters
Nearest Neighbor Ratio	0.000000
z-score	-127.229949
p-value	0.000000

**Dataset Information**

Input Feature Class:	TrafficAccident_11207
Distance Method:	EUCLIDEAN
Study Area:	335495527.346745
Selection Set:	False

# Incremental Spatial Autocorrelation



# Incremental Spatial Autocorrelation

The screenshot shows the ArcGIS Pro interface with two floating windows displaying the results of an Incremental Spatial Autocorrelation analysis.

**Left Window:** Incremental Spatial Autocorrelation (Spatial Statistics Tools)

- Started: Today at 上午 04:18:37
- Completed: Today at 上午 04:18:37
- Elapsed Time: 0.55 Seconds
- Start Time: 2024年11月13日 上午 04:18:37
- Global Moran's I Summary by Distance**

Distance	Moran's Index	Expected Index	Variance	z-score	p-value
1000.00	0.156133	-0.002358	0.000587	6.540334	0.000000
1100.00	0.148698	-0.002315	0.000511	6.680377	0.000000
1200.00	0.144717	-0.002304	0.000426	7.126809	0.000000
1300.00	0.131357	-0.002288	0.000366	6.983066	0.000000
1400.00	0.144805	-0.002252	0.000362	7.730975	0.000000
1500.00	0.149426	-0.002237	0.000339	8.234156	0.000000
1600.00	0.149717	-0.002232	0.000282	9.046065	0.000000
1700.00	0.153383	-0.002222	0.000263	9.603903	0.000000
1800.00	0.154396	-0.002222	0.000223	10.479539	0.000000
1900.00	0.141141	-0.002222	0.000197	10.216261	0.000000
2000.00	0.133924	-0.002222	0.000176	10.261348	0.000000
2100.00	0.123267	-0.002222	0.000159	9.945561	0.000000
2200.00	0.123097	-0.002222	0.000144	10.448059	0.000000

**Right Window:** Incremental Spatial Autocorrelation (Spatial Statistics Tools)

- Started: Today at 上午 04:21:45
- Completed: Today at 上午 04:21:45
- Elapsed Time: 0.93 Seconds

**Messages (2):**

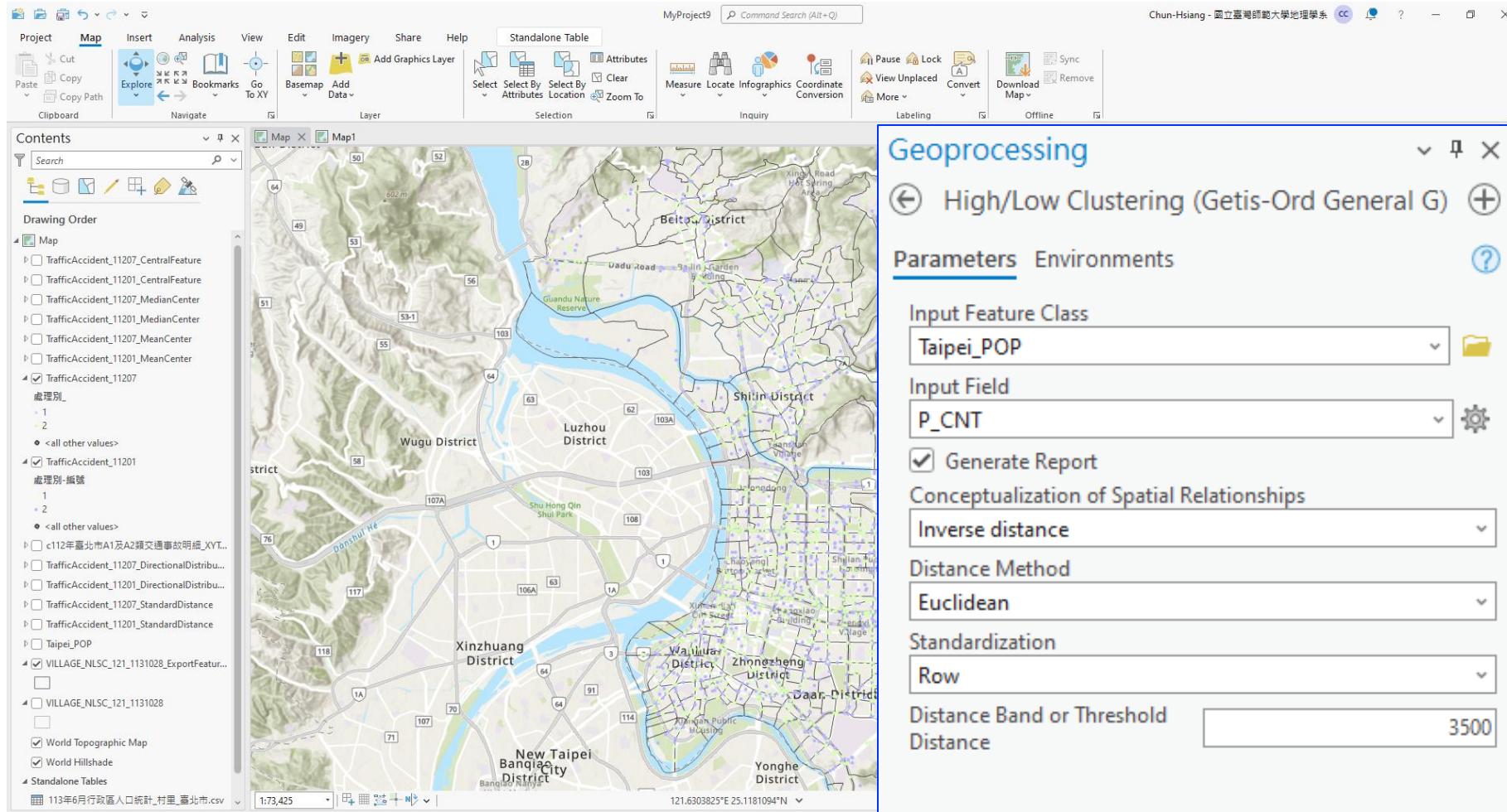
- i: 2500.00, 0.125572, -0.002208, 0.000131, 11.169025, 0.000000
- ! 2600.00, 0.121522, -0.002208, 0.000117, 11.460707, 0.000000

**Global Moran's I Summary by Distance (Continued):**

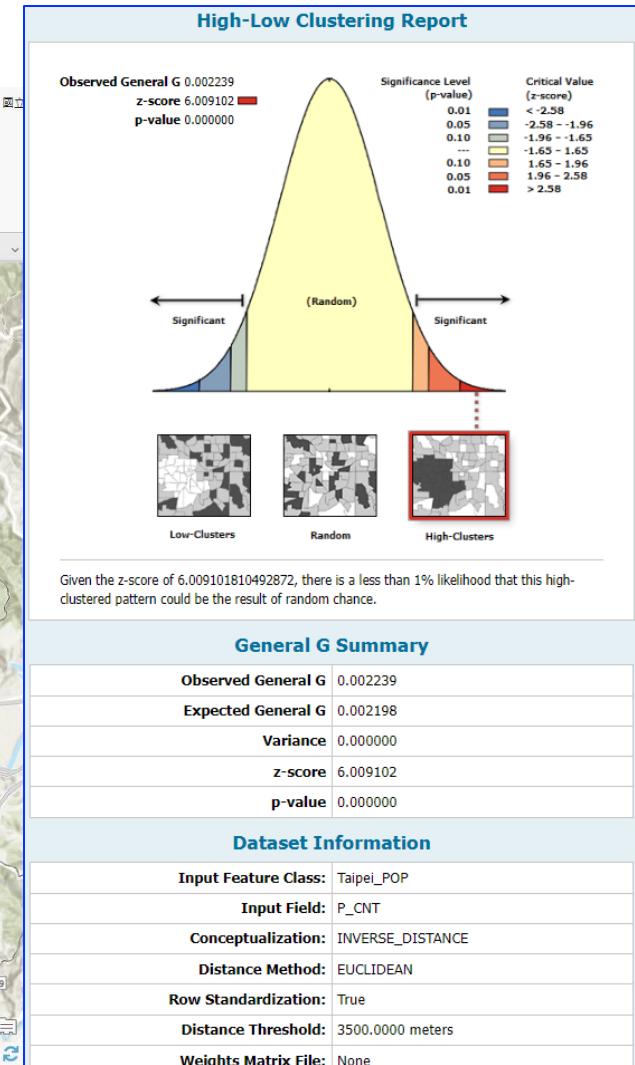
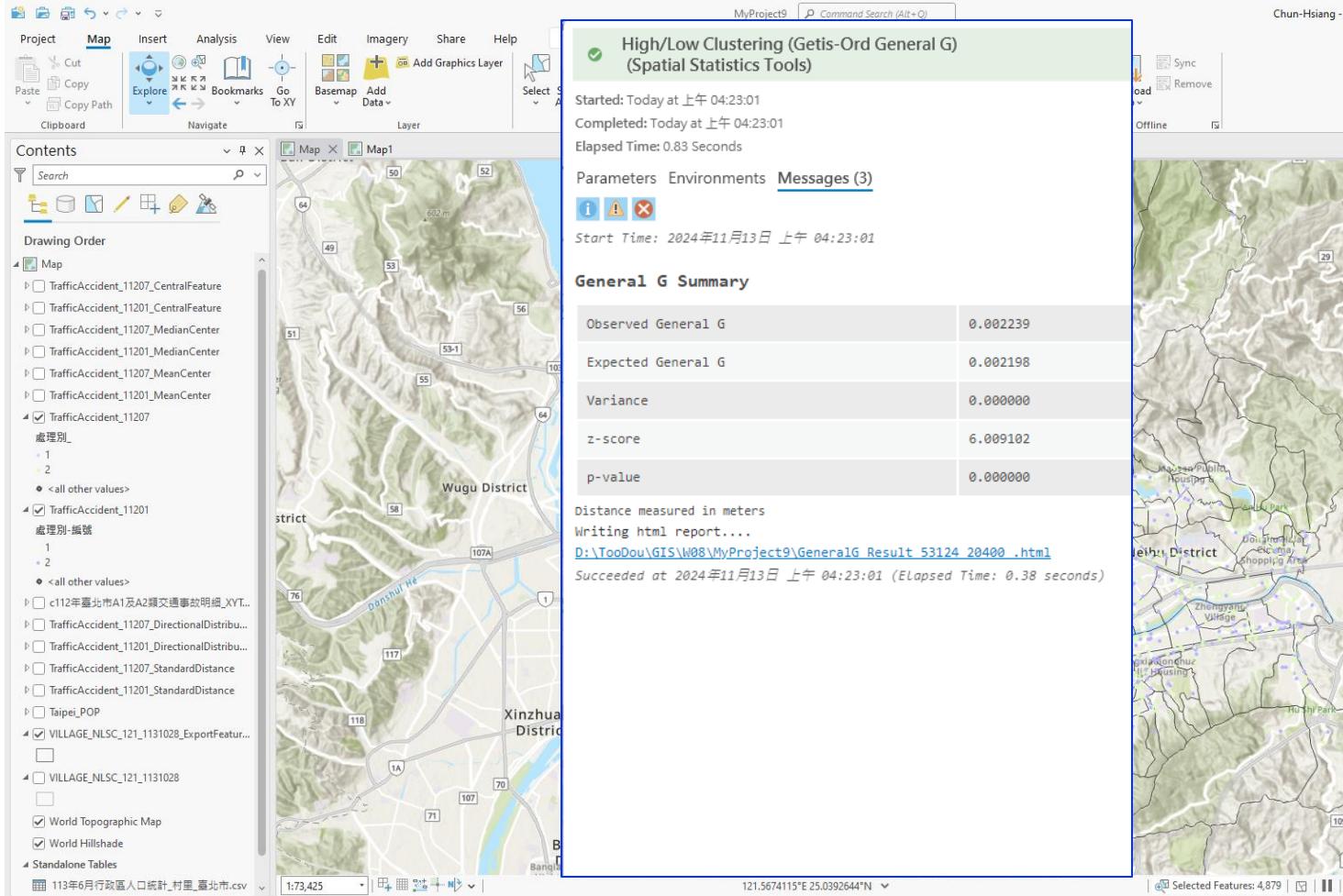
Distance	Moran's Index	Expected Index	Variance	z-score	p-value
2700.00	0.127851	-0.002203	0.000112	12.301740	0.000000
2800.00	0.116840	-0.002203	0.000099	11.952736	0.000000
2900.00	0.119902	-0.002198	0.000099	12.262365	0.000000
3000.00	0.112800	-0.002198	0.000093	11.913013	0.000000
3100.00	0.111527	-0.002198	0.000087	12.178951	0.000000
3200.00	0.106464	-0.002198	0.000082	11.974178	0.000000
3300.00	0.100378	-0.002198	0.000072	12.089024	0.000000
3400.00	0.099519	-0.002198	0.000066	12.511444	0.000000
3500.00	0.095681	-0.002198	0.000059	12.731467	0.000000
3600.00	0.091110	-0.002198	0.000056	12.484304	0.000000
3700.00	0.088794	-0.002198	0.000053	12.487737	0.000000
3800.00	0.086515	-0.002198	0.000051	12.476177	0.000000
3900.00	0.086593	-0.002198	0.000048	12.801933	0.000000

First Peak (Distance; Value): 1200.00; 7.126809  
Max Peak (Distance; Value): 3500.00; 12.731467  
Distance measured in meters  
Succeeded at 2024年11月13日 上午 04:21:45 (Elapsed Time: 0.28 seconds)

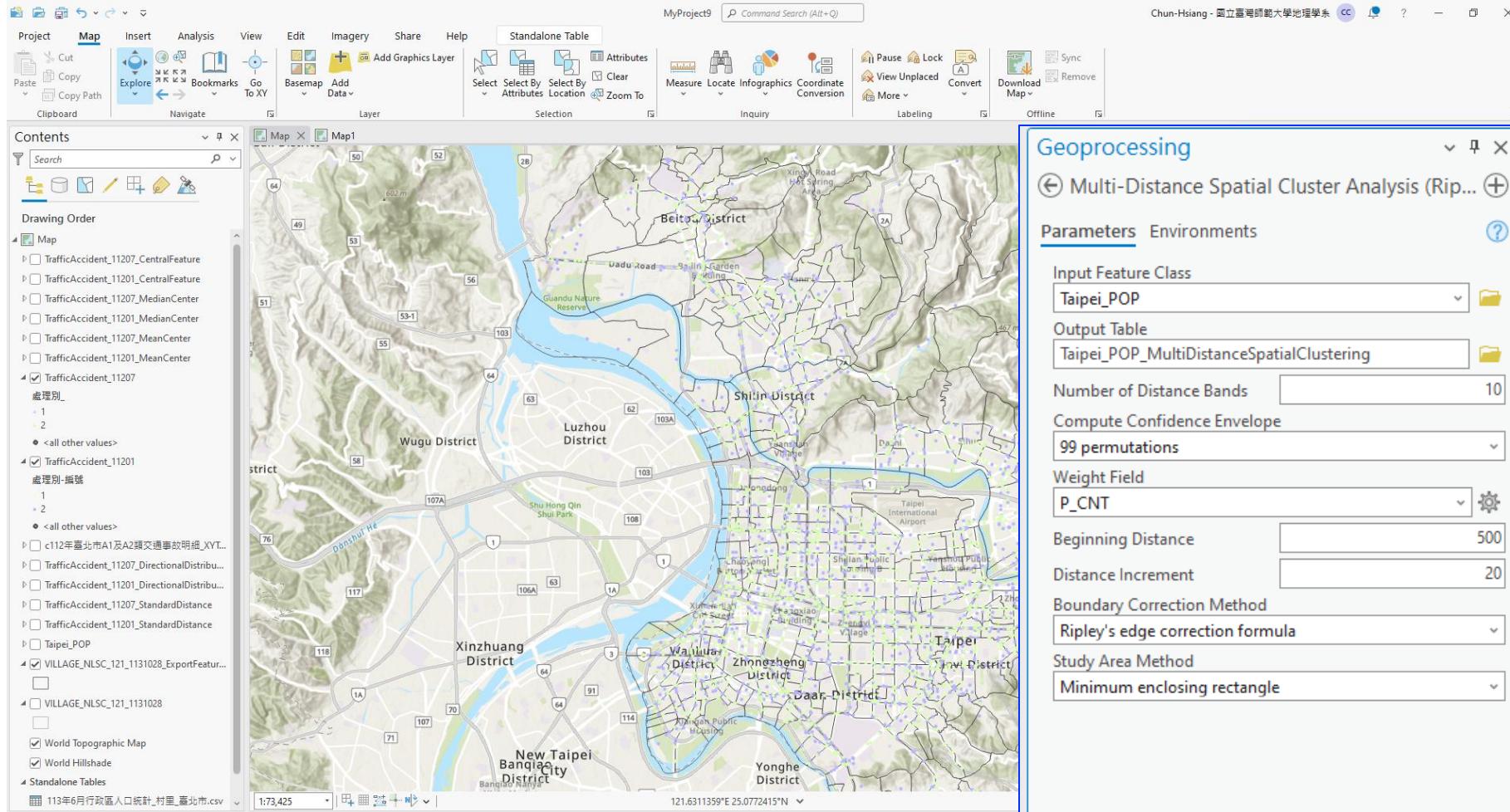
# High/Low Clustering (Getis-Ord General G)



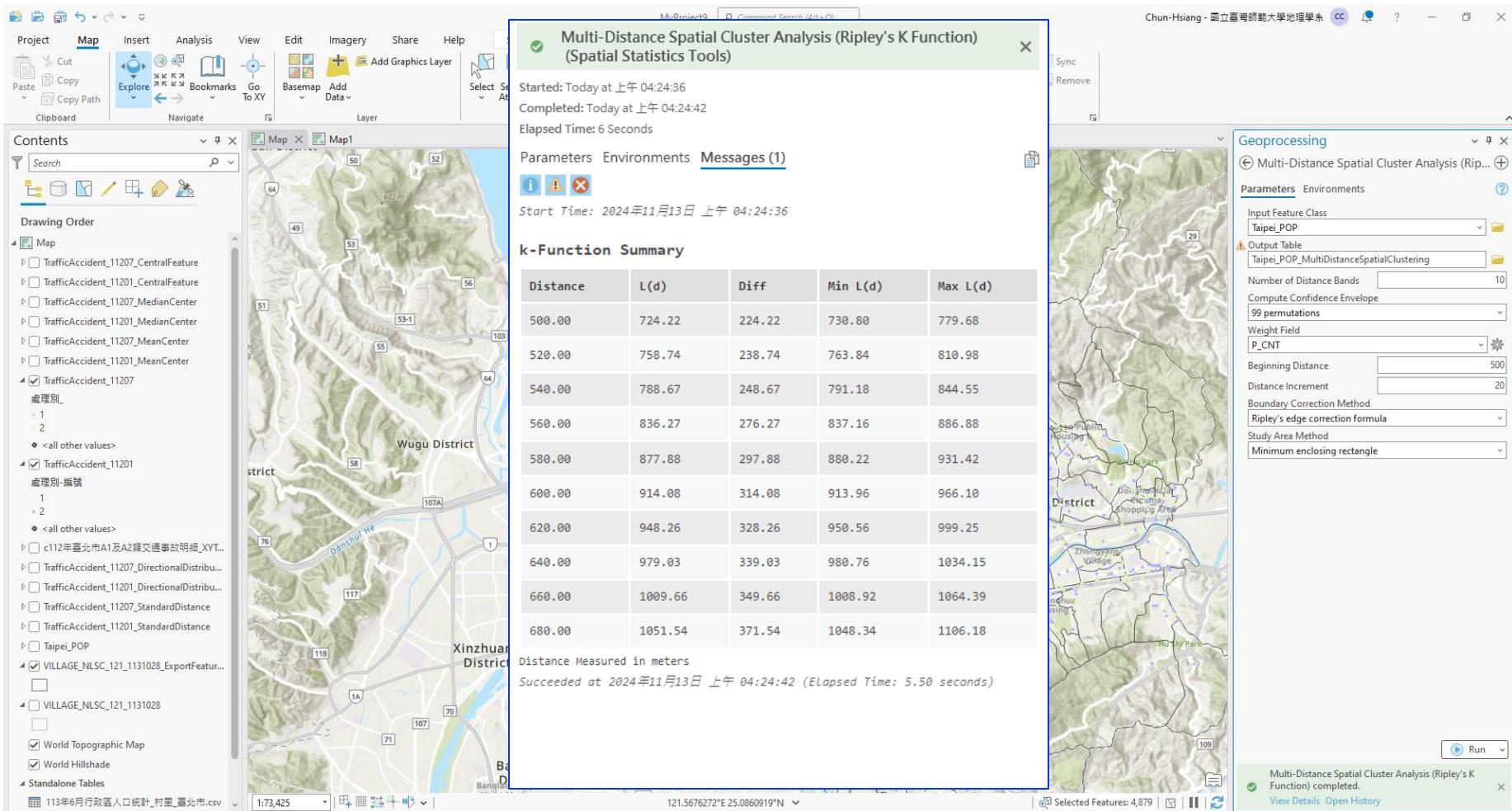
# High/Low Clustering (Getis-Ord General G)



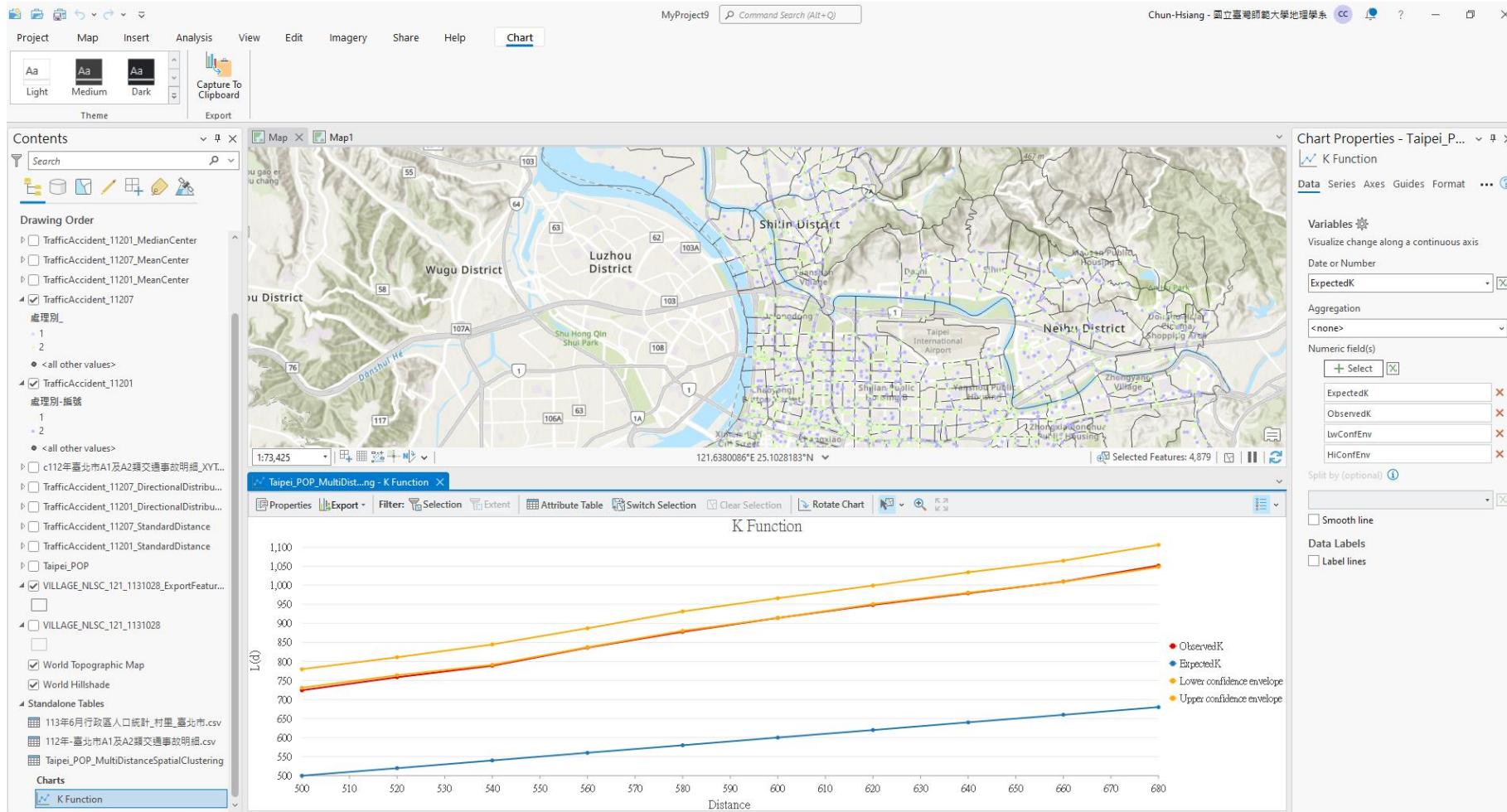
# Repley's k-function



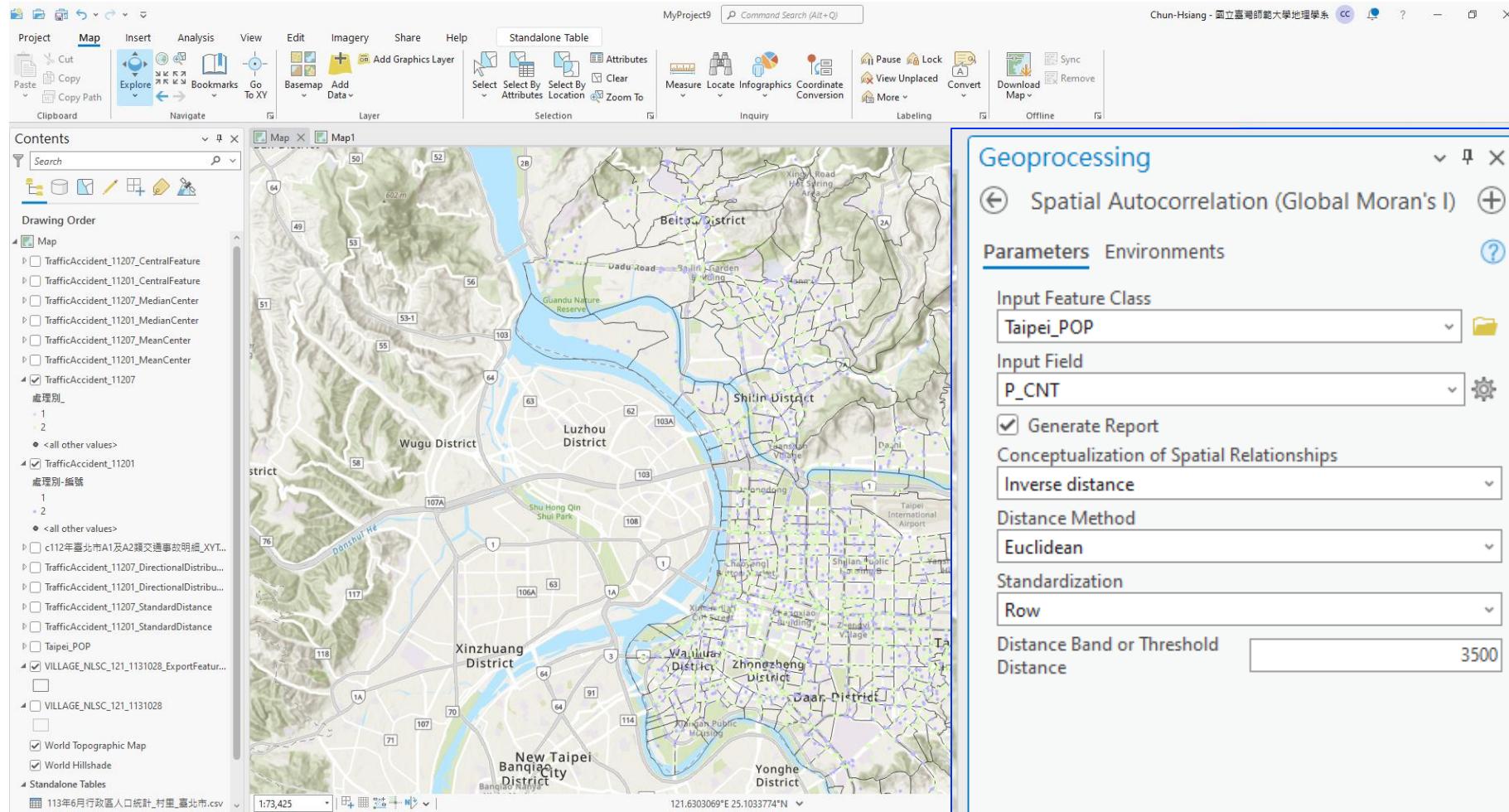
# Repley's k-function



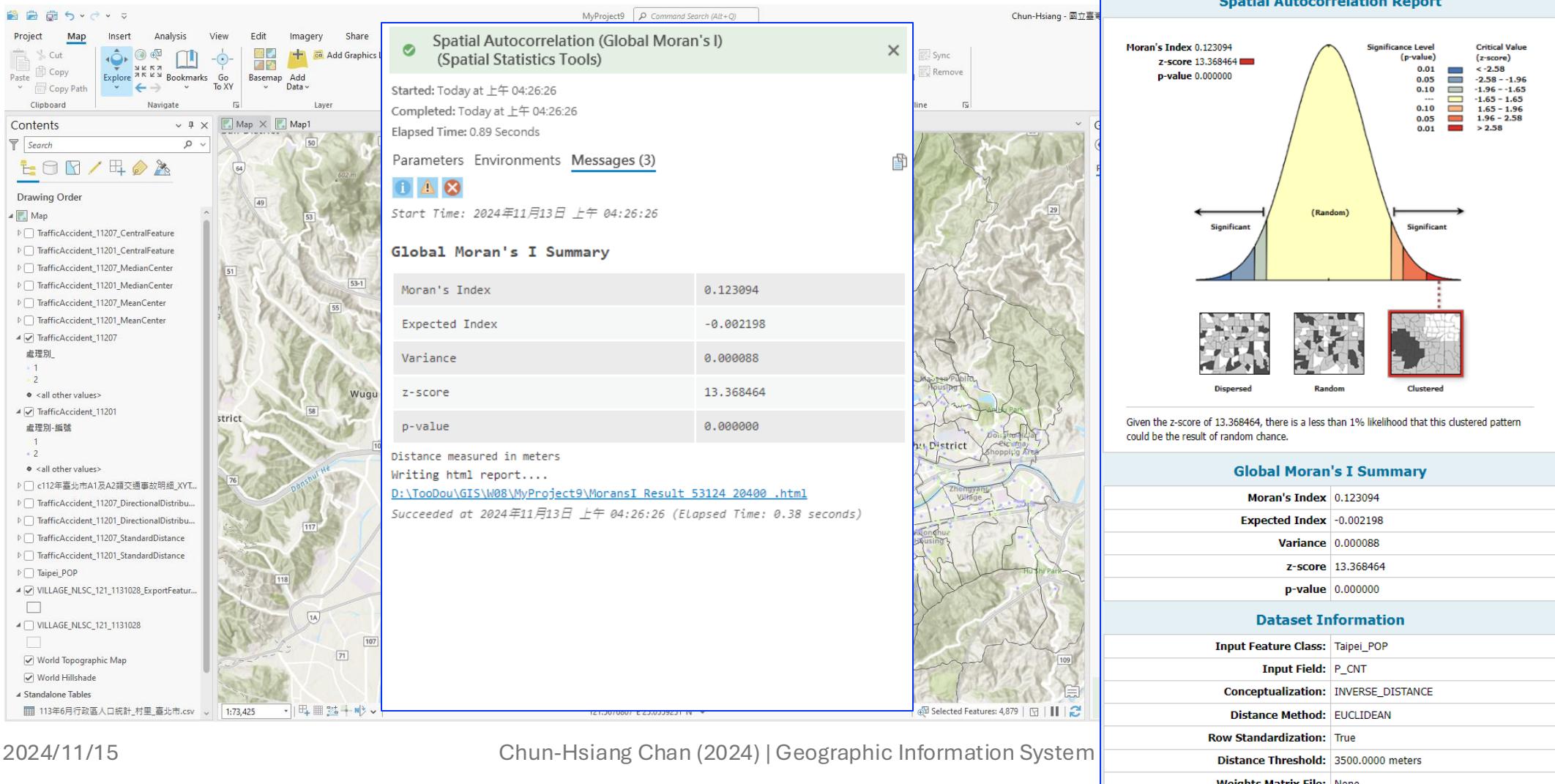
# Repley's k-function



# Spatial Autocorrelation (Global Moran's I)



# Spatial Autocorrelation (Global Moran's I)



# The End

Thank you for your attention!

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Web: toodou.github.io